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NATIONAL ESTUARINE POLLUTION STUDY. PROCEEDINGS OF THE MARYLAND-DISTRICT OF COLUMBIA PUBLIC MEETING HELD AT ANNAPOLIS, MARYLAND ON OCTOBER 30, 1968. VOLUME II

Federal Water Pollution Control Administration
Charlottesville, Virginia

30 October 1968

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CLEAN WATER

....FOR THE NATION'S ESTUARIES

PROCEEDINGS OF THE
MARYLAND-DISTRICT OF COLUMBIA
PUBLIC MEETING
ANNAPOLIS, MARYLAND
OCTOBER 30, 1968

VOLUME II

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PROCEEDINGS

Of The

MARYLAND - DISTRICT OF COLUMBIA PUBLIC MEETING

- - -

NATIONAL ESTUARINE POLLUTION STUDY

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

October 30, 1968

Francis Scott Key Auditorium
Saint John's College
Annapolis, Maryland

VOLUME II

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1. "The Protection of Maryland's Estuarine Areas," by Dr. L. Eugene Cronin.
2. "Report on Present Status of a New Simple Low Cost Coal Sewage Treatment," by Ellery R. Fosdick.
3. "The Potomac River Estuary as a Supplemental Source of Municipal Water for the Washington Metropolitan Region," by Ellery R. Fosdick.
4. "On Wedges and Corridors," The Maryland-National Capital Park and Planning Commission.
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6. "South Laurel-Montpelier - September 1968," The Maryland-National Capital Park and Planning Commission.
7. "Fairland-Beltsville and Vicinity," The Maryland-National Capital Park and Planning Commission.
8. "Potomac-Travilah and Vicinity," The Maryland-National Capital Park and Planning Commission.
9. "Goals, Purposes and Concepts for Future Development, Prince George's County, Maryland," by Community Goals Advisory Committee.
10. "A Reconnaissance Study of the Chesapeake Bay," by Regional Planning Council, Baltimore, Maryland.

MR. JENSEN: Do we have one more statement?

STATEMENT OF REAR ADMIRAL, RET. PAUL R. HEINEMAN, DIRECTOR OF ADMIRAL HEIGHTS IMPROVEMENT ASSOCIATION AND VICE-PRESIDENT OF THE SEVERN RIVER ASSOCIATION:

REAR ADMIRAL HEINEMAN: My name is Paul R. Heineman. I live at 343 Dewey Drive, Annapolis, Admiral Heights Subdivision, which borders on Weems Creek which empties into the Severn River.

I live on and own property on Weems Creek. As a Director of the Admiral Heights Improvement Association, which represents and speaks for 500 families in that area, as Vice-President of the Severn River Association, which represents and speaks for some 2,500 residents along the Severn River Watershed, I wish to address my statement to an existing problem and to ask a big question at the end.

Briefly, the problem is that of continuing siltation and pollution of our creeks in this area and in particular Weems Creek, which is caused by the excessive erosion from haphazardly created mounds of earth at, in our particular case, the head of Weems Creek, which have been formed by the deposits of excavated soil from building construction.

In this particular area the largest deposit covers about ten acres of area and is estimated by the Soil Conservation Service at 170,000 cubic yards. The smallest one is about two acres in extent, the shoreline along these areas has advanced into the creek some 30 to 40 feet, and the depth of the stream has been reduced 12 to 18 inches in its upper reaches over the past three or four months.

O[illegible] two associations have been pursuing this problem for a year now and have tried every conceivable avenue of help in an effort to stop the pollution of the creek. We have by letter, by phone, by consultation, implored the City, the County, developer and contractors involved, Anne Arundel Soil Conservation District, the Maryland Department of Water Resources, Chesapeake Bay Foundation, United States Soil Conservation Service, Federal Water Pollution Control Administration, Congressman Rogers Morton, the Vice-President of the United States, Lady Bird Johnson, and finally President Johnson himself. All of this to no effect.

There has been no corrective action to date. There appears to be no legal way to correct this sort of damage to an estuary. Having stated our problem, I now ask the question which I hope you can answer. What can be done to stop the siltation and pollution of our estuaries from such haphazardly created mounds of excavated soil? Thank you.

MR. JENSON: Thank you very much. We had your card here, it had gotten shuffled in. Very glad you did present this, though.

I want to mention that at our hearing held in South Carolina,some similar statements were made and the paper made quite a point of it. Within a very few days afterwards there were additional advices. I would like to hear Mr. Gardner's comments on this. He has been very quiet.

MR. GARDNER: I don't know whether to thank you or not. I recall the letter that did come to our office. It was discussed with the State agencies, and they indicated that they had been looking into the situation, and we told them we had received the correspondence and sent them copies of it.

Normally this is the process when we receive a citizen's letter to request information from the State and to bring both to the citizen and pass on the request to the State agency.

Actually, with the situation being in an estuary, we are indeed concerned with zoning or soil conservation programs, if they were in being, this would be the approach to attack it. If there are none in being, then it becomes a very difficult problem. I have no solution.

MR. JENSEN: We have another comment from the Panel.

MR. SILBERMANN: I know the hour is late, but with the question being raised by you, Mr. Chairman, I think we should say Mr. Heineman and myself and others have met on this particular problem a number of times. He knows the State has been sincere in making an effort to do something about that. I think the very patient people who remained with us so long should know that, although our experts have recommended sediment pollution control be enforced at the county level, in this instance we have a county responsible for sediment pollution continuing over a period of time. We have had promises, very recently again, that the problem would be solved. It is mainly a problem of finances now to correct a rather improper situation which is easily disposable. We are hopeful and will pursue this to a successful conclusion, but at the present time it is local government causing the erosion problem; yet the situation is no different than if it were an industry or somebody else. I wanted you people to know the effort has not been stopped, that we will continue to work with Mr. Heineman to bring this to a successful conclusion.

MR. JENSEN: I am afraid this particular kind of problem he has discussed can be found in almost every community. It is something we really don't have a completely adequate mechanism for keeping with.

MR. SILBERMANN: This instance, the solution has been devised by the local soil conservationist, he is able to help in this matter, he said. If finances are made available by the County, I think the problem can be abated. This needs to be done. The State Department of Water Resources has made an effort to bring this about -- talking to and dealing with another agency, in this case a County agency, to make the money available and to get the project started and completed.

MR. JENSEN: Thank you, Mr. Heineman.

REAR ADMIRAL HEINEMAN: We know, of course, the cause, it is quite evident. We know efforts have been made in the way of even planning to some degree -- some futile, some apparently under way -- and those plans are, of course, of long-range effect.

What in particular we are anxious to achieve is some immediate or prompt correction which we have been trying to achieve knowing that the County, for example, has taken on some consulting engineer to draw up a long-range plan which will be next spring, and our immediate worry is what can we do to stop it now? Our efforts have been to at least put in some temporary measure which would at least serve us over the winter storms, and of course, go perhaps into the long-range and final or permanent plans in the spring.

There have been many efforts made, I grant you, to achieve success in the matter, but they have not been successful up to this time. It was our purpose, Severn River Association in particular, to use this as a criterion for the entire Severn River Watershed to show what one small example can bring in the way of -- so far, we will call it really futility, and we are really coming up to ask a question which may not be fair.

What can be done? Of course, I don't know that anything more can be done than what has been done, but I thought we might be able to find some other effective, either legal or other means, to correct the situation.

MR. JENSEN: I think for purposes of this meeting you have very adequately documented the existence of another type of problem we need be concerned with ultimately with estuaries. I am sure also various State agency representatives here will keep this in mind at the veryleast. I do thank you very much.

Dr. Cronin.

STATEMENT OF DR. L. EUGENE CRONIN, ON BEHALF OF THE NATURAL RESOURCES INSTITUTE, UNIVERSITY OF MARYLAND:

DR. CRONIN: Mr. Chairman, I first would like briefly to salute the agencies represented here by the Panel. I wrote a paper last year on Protection of Maryland's Estuarine Areas which I would like to put into your file, not the record, documenting briefly the imaginative and vigorous and courageous steps that Maryland has taken.

The reason we are still concerned is that the problems are so rapidly growing, so vast, that even hard work and imagination have a difficult time keeping up with them. I have very great respect for the work done by Maryland agencies, and I know they will continue to apply that kind of industry and intelligence.

I would like to speak to the reasearch which I think must be undertaken for optimal enduring use of the Chesapeake Bay, with emphasis on water quality and water use. I would like to enter into the record a document entitled Developing and Managing Estuaries, prepared for the Atlantic States Marine Fisheries Commission by a special committee as a statement of policy and guidelines.

It deals with objectives, with adequate inventory, with research, with control of alterations, and suggests certain immediate actions at the Local, State, Interstate and Federal levels, which we felt could be effective and constructive. I would like that for the record.

MR. JENSEN: It will be included in the record.

DEVELOPING AND MANAGING ESTUARIES. A Statement of Policy and Guidelines for Effective Actions.

The most useful aquatic areas in the world are in serious danger of destruction. The estuaries, where fresh water, land and sea meet in a dynamic and productive zone, are gravely threatened through unwise and unplanned excessive use of their valuable capacities. Specific problems in estuaries vary almost infinitely, but guideline policies are pertinent to most of the management problems involved. This statement presents such suggestions related to policies.

Estuaries include the coastal zone which is affected by both the run-off of fresh water from land and the salt water from the sea. This zone includes tidal rivers, marshes, bays and river mouths, the inshore edge of the ocean, and the land areas which interact with these. Policies for use of these areas should be based upon the natural resources contained in this great coastal zone and upon the complex human uses made of the zone.

The value of estuaries is well established -- but appreciated by only a tiny group. It is not appropriate to provide here detailed statistical summaries, but the intense uses being made of coastal waters must be noted because they are so expansive, so competitive and potentially so destructive. All shipping for industrial or military purposes begins and ends in estuaries. The wastes of the great coastal industries and of a third of the people in this country are poured into these waters. About three-fourths of the fish and shellfish needed for food production and recreational fishing are totally dependent upon finding suitable conditions in estuaries. The coasts are in exploding demand for aesthetic and recreational use.

Each of these is an important human use -- but shipping requires dredging and spoil disposal and too often produces destructive oil slicks or spilled toxic cargo. Treated sewage ruins healthy water by over-enrichment, and poisonous industrial wastes are still increasing. Even aesthetic use, which almost sounds above reproach, irretrievably destroys the ecosystem when vast areas are dredged or filled for housing -- so that part of the reason for moving to the shore no longer exists. All of these uses, and others, have developed without comprehension of their effects and interactions and without plans for an optimal balance for present or future human uses. Present and potential uses involve vast and complicated economic problems, political and geographic difficulties, grave social questions and frightening legal complications. Nevertheless, they must be resolved, since the uses and abuses of estuaries are now unmanaged, irrational, and often absolutely incompatible.

The estuaries are complex. A marvelous and productive ecosystem has emerged slowly over thousands of years. The river, the land and the sea all make essential contributions. Biologically, the estuarine zone contains a unique mixture of species which produce very large crops. Some species are permanent residents, taking full advantage of the capacity of the estuary to trap nutrients. Other use the estuary as the oceans' greatest nursery or as a grazing area. The estuarine ecosystem is not yet fully comprehended, but enough is known to show that the entire system can be easily damaged or permanently destroyed if detrimental changes occur in the river, on nearby land or marsh, in the coastal ocean or in the estuary itself. It is extremely easy to destroy quickly resources which cannot be renewed as rapidly -- or to destroy permanently and irreversibly an essential link in the estuarine ecosystem.

As guidelines to effective management of these areas, the following specific proposals are made:

1. The objectives of estuarine management must be identified and agreed upon.

2. An adequate inventory must be made of the estuaries and of their present and potential human uses.

3. Research must be intensified to provide the bases for rational decisions.

4. Controls must be established over the alterations which are occurring and those which will be proposed.

5. Immediate action should be carried out at all levels of government toward improved management.

All of these are urgent requirements and very difficult tasks. Many points of view must be expressed and reconciled, and the Atlantic States Marine Fisheries Commission suggests that the following comments may provide some initial stimuli:

In selecting objectives:

a. Multiple usage exists and will be intensified. A rational balance among such uses will be required.

b. Long-term objectives must take clear precedence over short-term gains. This is especially critical when a short-period use would destroy an essential link in the ecosystem.

c. The objectives must be consistent with the basic principles of biology, chemistry, physics, economics and government or they are doomed to failure.

d. Objectives will inevitably vary from place to place and from time to time. General objectives must, however, be sought for large coastal areas and specific objectives must be clarified for each watershed system.

On taking inventory:

a. In general terms, our estuaries have never been properly described. Good management will require thorough description of these areas and resources, careful analyses of all of their present uses and projection of the best possible estimates of future uses.

b. Inventory must also include measurements of present and potential damage and losses, based upon reasonable measurement and prediction.

c. Valuable leadership has been given by such States as Massachusetts, New York, Delaware and others, by the Federal-State efforts toward an estuarine inventory along the Gulf of Mexico, by the wetlands surveys of the Bureau of Sport Fisheries and Wildlife, by the new program of the Marine Resources Committee of the Belle W. Baruch Foundation and by other agencies and individuals. These now provide useful assistance, but will not alone be adequate.

d. Inventories must be carried through to estimates in terms of measurable economic value.

e. Adequate and standardized methods for inventory are generally lacking. They are urgently needed and should be developed at the earliest possible moment.

f. Statistical systems for recording and analyzing the many uses of estuaries are insufficient. They must be improved and more widely utilized.

On research:

a. Although present levels of research in estuaries are impressive, the emphasis is very recent. Knowledge is far from sufficient to provide the specific details and broad principles which must be available for optimal management.

b. Research should be carried out at all pertinent levels of basic science and of applied science. The upper limit should be set only by the availability of competent scientists. Research should be supported at colleges and universities, in private industry, at State and Federal laboratories, and wherever else competence may appear.

c. Biological research is especially needed on the life history and requirements of useful species, on the causes of natural and man-induced fluctuations in abundance, on the biological effects of various modifications in the coastal environment, and on the flow of energy into and through the various estuarine ecosystems.

On control:

a. Jurisdictional responsibilities must be clarified. These will be very difficult indeed, since they involve private owners, towns, counties, States, the national government and occasionally international groups. These often involve traditional and jealously guarded patterns. It is also true that ownership often differs from jurisdiction for management, by health controls, fishing regulation, pollution laws, et cetera. Without clarification of jurisdiction, however, optimal management can never be achieved.

b. Traditional responsibilities of the States and of the Federal government are central to effective controls and merit urgent attention and clarification.

c. Controls cannot be adequately designed or effectuated without prior selection of objectives, inventory and research.

d. In view of the present rapid degradation of our coastal areas, interim controls are imperative. These must be conservative. We suggest that controls must be most conservative where knowledge of effects of change is weakest.

e. Zoning of specific locations and areas of estuaries appears to be an essential tool for management. There is substantial danger, however, that zoning may be carried out with insufficient regard for the essential unity of the estuarine system and without proper attention to the distant effects of local uses.

On action:

a. At the LOCAL level, we urge

1. public education on estuaries.

2. analysis of legal problems in management.

3. specific conservative controls when

pertinent.

4. acquisition of title or the development rights of border lands and waterways in the public interest.

5. zoning of coastal areas, based on a conservative approach and implemented by strong regulation.

b. at the STATE level, we urge

1. public education on estuaries.

2. formal and definitive analysis of legal problems, with development of specific corrective legislation.

3. firm and conservative interim control of the uses of the estuary, especially for

a. domestic and industrial waste disposal.

b. dredging and spoil disposal.

c. destruction of wetlands.

4. thorough inventory of present and future values and losses, in close cooperation with other agencies.

5. thorough monitoring of present water and land quality and of changes occurring in that quality.

6. rapid acquisition of appropriate estuarine areas.

7. fresh and comprehensive development of objectives, policies, plans and practices for the optimal management of estuarine areas.

8. support and encouragement of research on the estuary, to permit protection of present values, prevention of destruction, and positive achievement of the optimal values of these areas.

9. effective coordination of the many government agencies involved in estuarine use and management.

c. At the INTERSTATE level, we urge

1. support of public education on estuaries. For the Atlantic State Marine Fisheries Commission, this will include preparation of a leaflet of excellent quality on the nature, values and optimal uses of estuaries. This could be widely distributed to public officials for present guidance and to schools for education toward the

future.

2. vigorous support of State and Federal efforts toward development of objectives, inventory, research and control.

3. further expression of a strong and persuasive statement of policy on estuaries.

4. development of suggested legislation on estuarine development and management.

5. improvement of mechanisms for dealing with situations, where two or more States are involved in estuarine problems.

6. interstate planning for protection and enhancement, as is being accomplished by several river basin commissions.

d. At the FEDERAL level, we urge

1. public education on estuaries.

2. efficient coordination among the several departments and multiple agencies which are involved in estuarine responsibilities.

3. appropriate research by Federal agencies and support of research by other competent agencies

and individuals.

4. special leadership in development of methods for inventorying estuaries, evaluating the uses of estuaries and expression of Federal policies.

5. continued acquisition of appropriate areas, through Federal or cooperative Federal-State programs.

Adopted by the Atlantic States Marine Fisheries Commission, October 7, 1966, at Portland, Maine, Ronald W. Green, Chairman.

Recommended by the Biological Committee of the Commission, Dana Wallace and David H. Wallace, Co-Chairmen.

Prepared by the Estuarine Committee, L. Eugene Cronin, Chairman, Robert Dow, Robert Hutton, C. Robert Lunz, Eugene P. Odum, John Poole, Roland Smith, Albert Swartz, Frederick Wilbour.

DR. CRONIN: Research is for prediction. Research leads us to sufficient understanding to allow us to say if you take a certain action, we know what will follow.

I have divided my suggestions into three general areas. First is areas of research, which I think are important for understanding and use of all estuaries.

One, we must increase basic research on the whole system. We must know more quickly about the physical and chemical oceanology of estuaries, about geological processes which occur, about the biological processes, and how all of these are interacting in the system. I think these should be speeded and enlarged and limited only by the availability of competent people if we are going to have answers soon enough.

Second, I think we must have vigorous research on a widespread group of very practical problems:

The effects of engineering change, like the Chesapeake and Delaware Canal, silt and its shifted location from dredging and filling, from land erosion, from shore erosion;

The effects of enrichment around great metropolitan centers of people;

The effects of specific materials that were used -- thinking of such pollutants as chemical pollutants, industrial pollutants, human pollutants -- and all these are insufficiently known at the present time to make predictions in quantity and quality that will protect and allow us to make good decisions.

Third, we must have research and decision on the economics of estuaries, must be able to put values on the present parts of the systems, and to measure fairly and accurately the costs and benefits to be made by certain changes in that system. It is a very imperfect process; yet, such information must be before us if we are going to make rational decisions.

Fourth, I think we need continued research on the adequacy of our water quality standards and criteria as they apply to estuaries. Many have been transferred from fresh water and other situations, many are based on partial knowledge that may not be sufficient.

Fifth, we must know more about the energy flow, know more about what the wetlands contribute, what does the great bottom community in the estuary contribute, how can we take the best harvest for human utilization without disturbing the flow of energy in the system.

Sixth, I know little about the social and political problems, except I know they are present and very great, and we must convince people to accept what we know and what we decide. We must find political ways to have it applied.

Seventh, there are legal problems involved, there are very complex problems outside my area of competence, except as I go up and down the coast and the other coasts of the country, I have seen them in a hundred different forms as people are uncertain about the legal future of estuaries and their rights in them.

All of these should add up to prediction and wise use before changes are made and not after the change is made when we are in a loss situation.

The second group of suggestions very briefly are those which seem to me unusually urgent for the Chesapeake Bay:

One, to help understand physical changes and make wise choices we must have that hydraulic model. It will speed up our learning enormously. It will help us learn in a few days what will otherwise take decades to measure or estimate. There is the matter of the flow of the Susquehanna River, the effect of various tributaries on the Susquehanna and on the whole system, the optimal installation and structuring of release devices for power plants, for sewers, or for any other modifications in the Bay, we can get a first approximation, which is of enormous commercial value as well as environmental value.

Second, we must learn the environmental conditions which will protect and enhance the desirable species and environmental conditions which will reduce undesirable species. We know parts of this, but we are not sufficiently informed.

Third, there is a large area of monitoring of physical changes of the chemical environment, sediment loads of wastes introduced that I think requires research for the whole Chesapeake and a great deal of application in the very near future, now running almost without observation.

The last group of suggestions I would make are those which seem urgent for the whole Chesapeake but especially important to Maryland. Again, we must learn the environmental conditions which best protect the desirable species and those which reduce the undesirable ones, those important to Maryland. To do this we must learn in advance the effect of possible pollutants and environmental changes on the principal species, all species that are abundant, all species that are commercially or recreationally useful, and all species which support them, and we must look at all stages in their life history.

We must include the oyster, clam, crab, the great nursery populations of fish, migratory fish, resident fish, mammals, birds, and the rest of the complex community, and we must know all stages that might be affected by nutrient addition because we have had a prediction that doubling of nutrients in the Upper Bay may bring destruction.

We must know the effects of silt and sediment because we have a probability of 45 to 90 million cubic yards of sediment transport, movement, and deposition in the Upper Chesapeake in the next ten years.

We should know the effects of heavy metals because the floor of Baltimore Harbor is an accumulation of the last hundred years, and some of it may need to be moved to other places. It contains materials which we must understand in order to protect ourselves.

We should know the effects of radionuclides, which for the first time may be a relatively large potential threat to some areas of the Chesapeake.

We must learn the effects of heat, because within a few years 15,000 to 20,000 cubic feet per second of heated water will be flowing into the Bay, making it in total the second largest river in the whole system.

We must be examining the special chemicals of pesticides, problems like fuel oil and other chemical questions since all of these tend to flow down to the estuary.

Second, we must focus on the local engineering changes, the Chesapeake and Delaware Canal change is a vivid example of a permanent effect on Maryland in which we do not have sufficient predictive knowledge.

We must learn to settle limits on the assimilation capacity of the system, how much waste can we put in, how much can we use the capacity of this wonderful system without destroying it.

We must learn the physical system of the Bay. The model is an excellent research tool. The Chesapeake Bay Institute and Johns Hopkins have distinguished potentials for Maryland, and they must be capitalized on.

We certainly must learn more about the role of our wetlands, learn about their potentials, their optimal management. We must know how much it is necessary to the Chesapeake and whether or not any of it can be utilized for other purposes without excessive damage.

More knowledge is needed on erosion control on land and at the shore. An inexpensive, practical, and effective method must be developed.

We still don't know how each area relates to all the others. If damage is done at Calvert Cliffs, where all migratory fish must pass going up and down the Chesapeake, we are not sure yet how this would affect the Upper Bay, in its uses, the Lower Bay, the coast, and even other regions of the Atlantic.

We need more knowledge about human wastes and dangers of transmission -- there was just a shadow of a suggestion last year that some pathogenic organisms in human waste may affect fish in ways that most certainly should be understood before they become serious problems.

Toward this I would like to make one particular suggestion. I would like to suggest that we select around the Chesapeake a tributary as a first model for fully adequate research, that we focus all abilities we now have and those we can attract on one tributary to understand it in these terms, then expand that knowledge to a series of typical tributaries, and eventually to the whole Bay and this marvelous and complex system that we are dealing with.

There are many other needs and education and interim controls and inventory and acquisition and objectives and coordination, but I don't think they are my proper area for discussion this afternoon.

One last comment seems pertinent. On the matter of the organization of research, I would suggest these guidelines:

One, that every competent agency and individual be encouraged and supported, no matter where he may reside or where his research may be carried out.

Second, I think the States have a special role here; in meeting their local needs, they must not depend excessively on the Federal government or somebody else to answer these problems, although answers can be drawn from all over the world to apply to our local questions.

Third, I think that agencies and instructors like the Chesapeake Research Council, representing the greatest reservoir of estuary biologists and scientists in the world, can look at the entire Chesapeake as a system and contribute unusually well to the needs that exist here.

Fourth, certainly the Federal research agencies, with their attention to problems of general application, will, I hope, be drawn into the problems of the Chesapeake and give effective and well supported attention to them.

I hope all this research will have effective coordination but not excessive coordination. Once you begin to run it like a factory, the imagination, the most valuable part of research, gets dull and becomes less productive.

Finally, research requires time. If we are to have prediction ahead of decision and adequate research ahead of prediction, it is of critical importance that research be expanded and adequately funded as soon as is humanly possible.

Thank you very much.

MR. JENSEN: Thank you, Dr. Cronin. (Applause.) It looks like someone from the Panel will react.

MR. GARDNER: Dr. Cronin, you indicated that all this expertise, all research take place in one estuary, concentrates in the one estuary, one tributary to the Bay. Do you have any suggestions as to which one?

DR. CRONIN: Mr. Sanderson suggested that perhaps the Patuxent River would be a fine focal point because we already have a considerable body of information and people. Perhaps it would. I haven't finished my own thinking yet. The Patuxent is getting so much damage and is under the threat of so much damage from population increase that someone suggested earlier it may be getting late for the Patuxent.

Perhaps it should be the Nanticoke, perhaps one of the small Eastern Shore rivers. The difficulty comes from the fact that no river here will answer all areal questions. I would really prefer to see about five chosen. I would like to see the Potomac as a big one, I would like to see the Magothy or the Severn as a small, poorly circulated system. I would like to see the Sassafras or Bohemia perhaps as a nearly freshwater system. The Nanticoke is a river of middle salinity. In Virginia there would be the Rappahannock and the York.

This needs a great deal of thought and long-term planning before we could settle down and say this is the best single place to start.

MR. JENSEN: The Estuarine Study had originally planned to sponsor a major national conference on estuarine research needs. For a number of reasons, we will now be unable to do that. Instead, I think that the research staff of WPCA will soon be in contact with you and a good many other scientists, associations, social scientists, marine biologists, oceanographers, and others, to try to solicit your ideas on types of research programs that are needed, types of research facilities that might be needed, I would think also to get some notion of the amount of money needed.

I hope you will feel free to submit additional information for the record here if you wish, and in addition I also hope you will be able to respond thoughtfully to any other requests of this kind we may have.

DR. CRONIN: I will be very glad to help.

MR. METZGAR: Dr. Cronin, when you talk about the research, my reaction relating to my experience on the wetland study -- and rather than research per se, we are finding out, or I am, that nobody has told me what our needs are other than preserving.

What are our needs from those areas in terms of how many tons, how many millions of tons of fish do we want, how many blue crabs? Nobody tells us this. If you measure research, why are you researching? You must have objectives and plans.

Secondly, I would like to reiterate or paraphrase something Mr. O'Donnell said at the Governor's

Conference on the Chesapeake Bay. Everybody wants to research and provide all kinds of information, but I have yet to meet the person that has a computer for a brain. I have been trying to put together all information that is available, trying to focus it so I can come up with answers on the wetlands study, and the pieces don't fit.

So if we have plenty of research -- I am not saying we don't need more, but I am saying that we will probably need a coordinating center for research before we run full speed on more research.

I agree with your point, Roy, that other areas are also critical in importance. We are not moving as well on some fronts perhaps as we are on research now.

On the other hand, you cannot manage the things you don't understand, and no matter what kind of government structure you set up or what kind of objectives, unless you understand the system and do have sufficient research, it cannot work.

I might call your attention to the statement in this fairly short policy summary. This is what we said then about selecting objectives.

a. Multiple usage exists and will be intensified. A rational balance among such uses will be required.

b. Long-term objectives must take clear precedence over short-term gains. This is especially critical when a short-period use would destroy an essential link in the ecosystem.

c. The objectives must be consistent with the basic principles of biology, chemistry, physics, economics and government or they are doomed to failure.

d. Objectives will inevitably vary from place to place and from time to time. General objectives must, however, be sought for large coastal areas and specific objectives must be clarified for each watershed system.

I agree that we should have very positive and well defined objectives. You cannot work without them.

MR. JENSEN: We have several statements to be included in the record, and we will have them included at this point.

STATEMENT OF MR. JOHN T. STARR, ON BEHALF OF

THE BALTIMORE DISTRICT, CORPS OF ENGINEERS:

The world's estuaries afford protective harbors, significant amounts of food, and vital transportation links between inland agricultural, industrial, and commercial areas and the routes of commerce on the high seas. A good number of the great industrial and commercial cities of the world are located on estuaries. The well being of millions of people is intimately tied to both the natural phenomena of estuaries and their uneasy relationship with the often disruptive activities of man.

The works of man in an estuary's drainage basin can have profound and lasting effects. Upstream impoundments and interbasin transfers of fresh water can materially affect salinity concentrations in estuarine water, the ecology of aquatic life, and the flushing of the estuary. Agricultural practices and construction activities accompanying the rapid rate of urbanization accelerate geological processes by multiplying many times the natural sediment inputs to estuarine systems. Industrial, agricultural, and urban activities introduce large amounts of nutrients, toxic materials, and other deleterious substances into rivers and bays, greatly affecting biological activities in the marine environment.

The water-use conflicts expected in the future are for the most part already apparent, and provide a means for forecasting the magnitude and extent of the challenge which must be met. A partial listing of present and future conflicts would include:

Municipal and industrial wastes, thermal loads versus clean water, aquatic life, recreation;

Land and shore development versus wetlands, recreation legal implications of bay bottom ownership and water itself;

Sediments from urbanization, agriculture, dredge spoil disposal versus aquatic life, navigation. preservation of wetlands;

Commercial fishing versus species survival, sport fishing, recreation boating, land uses;

Debris versus recreation.

These conflicts are only a few of the many known relationships. Actually, the competing uses considered singly and in groups comprise an endless variety of combination of stresses on an ever-changing and extremely fragile system.

Chesapeake Bay is an excellent example of such a system. It is the largest estuary on the Atlantic Coast of the United States and one of the important estuaries of the world. It produces large crops of estuarine species, the most important economically of which are the soft-shelled clam, oysters, blue crabs, menhaden, and rock fish. In recent years the commercial catch has exceeded one-half billion poundsannually, and is valued yearly at more than $65 million. The quantity of fin-fish landed by sport fishermen possibly exceeds the entire commercial catch. Commercial fishing provides a means of livelihood for approximately 10,000 persons, and sport fishing is enjoyed by many thousands.

This is, however, only a small part of the value of Chesapeake Bay as a natural resource. Waterborne commerce, totaling 110 million tons annually, moves over the waterway and contributes, in large measure, to the economy of an 11-State area, extending into the Midwest. With the trend toward larger ships, which in turn will require deeper channels, greater problems are being posed in locating dredge spoil disposal areas. Modifying channel geometry may cause increases in upstream salinity, and unwise disposal of spoil can have marked effects on living marine organisms.

The population of the immediate Chesapeake Bay area was approximately 3.8 million in 1960, and is expected to double by 1985. The Bay area contains rich farmlands, far-stretching woodlands, and intensively developed industrial areas which are steadily increasing in importance. As an example, the largest steel making plant in the world is located at Baltimore near the head of the Bay.

The rapid increase in population and the accompanying rapid increase in water-oriented pursuits have resulted in problems concerning the optimum management of the Bay resources. The basin includes developed areas which sustain a vigorous economy and other areas where the economy is depressed as a result of technological changes. The development of resources is essential in both kinds of areas; for the first, to maintain and expand existing economic activity, and for the latter, to stimulate development through the creation of an important element of the base upon which new economic activities can grow. In depressed areas, industrial development and recreation, considered as an industry, are expected to be prime factors in economic development. Elsewhere in the Bay area, several of the major water-using industries are expected to grow as fast, or faster, than the National rate for such industries, creating demands for water of adequate quantity and quality.

With more intensive urban development, problems associated with water resources management in urban areas become both acute and complex. Of primary concern are the nutrient and chemical loads to which the Bay system is increasingly being subjected. An excess of nutrients frequently leads to explosive blooms of algae and to stimulating the growth of noxious aquatic weeds which triggers other problems. Noxious weeds tend to trap silt, potentially causing a shoaling problem. They make it impossible to operate small boats in areas which are heavily infested, and they otherwise affect the recreational and aesthetic uses of waterways. Damage done to the estuary by excess nutrients is virtually irreversible because of the continuous recycling of the nutrients.

There are other significant threats to the Chesapeake Bay environment. These include both inter- and intra-basin diversions of fresh water. Fresh water diversions can alter the salinity regime of the headwaters of the Bay, affecting the spawning opportunities of many species of fish. The destruction of wetlands through filling for urban development can destroy areas that in some cases are many times more productive of food than the best farmland. This destruction will have a marked effect on food and cover for waterfowl, as well as the supply of organisms upon which fish feed.

Urban construction skins the earth's surface and sometimes increases sediment yields a thousandfold. Where they enter the Bay, these sediments can smother bottom life and otherwise create aesthetically objectionable conditions. Shore and bank erosion, over the centuries, have removed much fine agricultural land, and a number of islands in the Bay have disappeared. Increased impervious area, resulting from urban construction, increase both the magnitude and frequency of flooding. This can have a decided effect on water quality in the estuarine environment. There are few existing data on the quality factors in urban stormwater runoff.

Rapidly expanding electrical power requirements and the resulting demand for larger power plants are requiring use of large volumes of estuarine water for cooling purposes.

Recognizing these many and interrelated problems as they pertain to Chesapeake Bay, the Congress, in Section 312 of the River and Harbor Act of 1965, authorized and directed the Secretary of the Army, acting through the Chief of Engineers "to make a complete investigation and study of water utilization and control of the Chesapeake Bay Basin, including the waters of the Baltimore Harbor and including, but not limited to the following: navigation, fisheries, flood control, control of noxious weeds, water pollution, water quality control, beach erosion, and recreation. In order to carry out the purposes of this section, the Secretary acting through the Chief of Engineers, shall construct, operate, and maintain in the State of Maryland a hydraulic model of the Chesapeake Bay Basin and associated technical center."

The study has been assigned to the District Engineer of the Corps of Engineers in Baltimore.

Such a study of the water and related land resources of the Chesapeake Bay area requires a great diversity of technical, scientific and social skills. No one entity has within itself sufficient expertise to make a study of this scope and magnitude. There is, however, great capability within the various governmental agencies and the educational and research institutions of the Chesapeake Bay area to generate the requisite personnel to pursue a study of this magnitude and scope. The State of Maryland and the Commonwealth of Virginia support progressive state planning departments and water resource study and management departments that have been working on Bay problems for a long time. Agencies of the Federal Government which have been engaged in Chesapeake estuarine affairs include, in addition to the Corps of

Engineers, many of the component parts of the Department of Agriculture, the Department of Health, Education, and Welfare, and the Department of the Interior. Our on-going study of the Bay is conceived, therefore, not only as a multi-discipline, but as a multi-agency effort -- a coordinated partnership among Federal and State agencies and educational institutions.

Toward this end and to facilitate the harmonious combination of these talents, an Advisory Group has been established. It is composed of representatives of the Departments of Agriculture, Commerce, Health, Education, and Welfare, Housing and Urban Development, the Interior, the Navy, and Transportation, the Federal Power Commission, the Atomic Energy Commission, the National Science Foundation, the Smithsonian Institution, the State of Delaware the State of Maryland, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, and the District of Columbia.

This group, known as the "Advisory Group on the Chesapeake Bay Study", is convened as a body at such times in the course of the investigation as is necessary to furnish advice and guidance to the District Engineer and his staff, to coordinate study efforts, and to review and comment on the course of the study.

The hydraulic model and its associated technical center, the site of which is at Matapeake on the Eastern Shore of Maryland, will present an excellent opportunity for productive cooperation in estuarine research, engineering, and management. The scales of the model are 1 to 1000 horizontally and 1 to 100 vertically, which are the smallest practical scales experience has shown to be suitable to solve the many problems associated with Chesapeake Bay. It will encompass the Bay proper, all of its tributaries up to the head to tidal effects, and the adjacent overbank areas to the contour of 20 feet above mean sea level.

These geometric scales result in a time scale of 1 to 100, which means that a semi-diurnal tidal cycle of 12 hours and 25 minutes will be reproduced in about 7½ minutes, and a year of record in nature will be simulated in the model in a bit less than 4 days of continuous operation. The model will also allow the simulation of many combinations of natural conditions, including fluvial discharges from tributary rivers. Mathematical models will be utilized in the study to the extent that present model technology will permit.

With its long-time involvement in the study of estuaries, the Corps of Engineers is extremely interested in the National Estuarine Pollution Study which was authorized by the Clean Water Restoration Act of 1966. It ties in with the Chesapeake Bay Study which is now underway, with many of the same agencies taking part directly in both studies. As was noted above, the Department of the Interior, including the Federal Water Pollution Control Administration, and the States of the Chesapeake Bay area are working partners in the Chesapeake Bay Study. In fact, the Federal Water Pollution Control Administration is the chairman agency of one of the Study's task groups on Water Quality and Supply, Waste Treatment and Noxious Weeds.

Any data gathered and any studies made for the Chesapeake Bay Study will, of course, be available for the Estuarine Pollution Study, including studies made with the hydraulic model. You may be assured that we will cooperate in your study effort in any way we can.

STATEMENT OF MR. RALPH H. WILEY, ON BEHALF OF THE TRED AVON YACHT CLUB, OXFORD, MARYLAND:

For 40 years I have observed conditions on Chesapeake Bay from the Old Canal to Norfolk. The changes during this period are shocking.

The increasing quantities of fresh water taken from the Susquehanna for cities combined with the loss of fresh water through the C&D Canal have increased the salinity in the Upper Bay and greatly increased the sea nettle problem.

The water of the Tred Avon is no longer clear. Tug and barge traffic barely clears the bottom. This condition will be relieved when and if the river is dredged. However, high-speed motor cruisers cause heavy washing of the shores. Some effort has been made to control these cowboys, but much stronger measures are badly needed.

STATEMENT OF MR. LEONARD S. BLONDES, MEMBER OF THE PATUXENT RIVER WATERSHED COMMISSION:

Maryland is a State whose economy and development depend extensively upon its waterways. With the advent of urban development, the preservation of these waterways for residential, industrial and recreational uses has become a major concern.

The pressure from housing developers, oyster and crab fishermen and from boating and bathing enthusiasts is growing. Each contributes its own particular element of pollution. The preparation on the part of government to withstand these pressures has been stumbling and slow. Despite lip service to the pressing need to develop a plan and controls, bureaucratic interests often prevent action.

I have found sitting as a member of the Patuxent River Watershed Commission particularly frustrating for this reason. Although the Committee has been in existence for several years, each department involved is so jealous of its own authority that no single agency has been designated responsible to develop a plan.

Although we have attempted to have a bill passed in the State Legislature to place authority for overall planning and use in one State agency, the involved departments protest, and nothing is done. Hence encroachment continues and planning becomes more difficult, if more imperative.

The only agreement that has been reached is that the Patuxent River be considered first within the new pollution program. This deals with a single problem -- that of waste disposal plants. The problem is more involved than this. Adequate management and research must be developed to insure the adaptability of this river for varied uses.

I urge you to set up programs which will impel local and State authorities to take steps to provide comprehensive planning for our waterways. I urge incentives which will continue to encourage preservation of specific areas for specific uses.

Certainly, instrumental to the establishment of any effective plan in the vicinity of the Chesapeake Bay and its tributaries is the construction of the hydraulic model by the Corps of Engineers. The funding and development of this facility should not be delayed. Through operation of this model, the government will have an effective means of determining the total effect of any single use or development on the waters of the Bay.

Finally, I would like to emphatically support the study of sea nettles currently in its second year in the State. This inconvenient resident of our waters has long hindered the development of Maryland waters for recreation.

The immediate control of pollution and the restriction of usage must be undertaken in a positive and clearly designed program. The urgency is NOW. Each year we delay limits some of the planning alternatives open to us, and hence, limits the usefulness of our waterways to us.

STATEMENT OF MR. LEONARD A.A. SIEMS, CHAIRMAN, MARYLAND INDUSTRIAL DEVELOPMENT FINANCING AUTHORITY:

As Chairman of the Maryland Industrial Development Financing Authority, I am interested in attracting industry and have industry locate in Maryland in order to improve an already well-rounded economy.

As residents of Maryland, my family, my associates, and I wish to protect our resources in the estuarine areas. Further, the industries and recreational activities depending on estuarine waters relatively free from pollution should not be hampered.

With our present technical knowledge it is not inconceivable that we are in a position to reconcile new industrial development with maintaining conditions mutually acceptable.

It is significant that the cost of pollution control is eventually transmitted to the public. Thus, allowing tax credits as an incentive, new industries locating in Maryland should favor at the very offset the pollution control program.

STATEMENT OF MR. OSVREY C. PRITCHETT, MAYOR, CAMBRIDGE, MARYLAND:

The Commissioners of Cambridge, Maryland, wish to take this opportunity to express their views relative to estuarine values and problems at this public meeting at St. Johns College in Annapolis. Canbridge, Maryland, is located on the Choptank River approximately 14 miles from the Chesapeake Bay on Maryland's Eastern Shore. A substantial portion of the economy of this community is based upon the water, both from recreational and from economic points of view.

The Commissioners have realized the vast potential of this sector of its economy over the years and are presently engaged in the design of a new wastewater treatment plant of the most modern design for the treatment of both industrial and domestic waste, to virtually eliminate the pollution of the Choptank River which might be due to the present inefficient and undersized primary treatment plant. The plant will cause an investment of about five (5) million dollars with the City's share exceeding one (1) million dollars during the years 1969-70.

The Melpar Corporation of Falls Church, Virginia, a research and development organization, is also constructing a demonstration project under your Department for the removal and storage of a mixture of wastewater and stormwater, into a storage module in the Choptank River. After the rain has ceased and the intercepter capacity is relieved, the wastewater is to be pumped from the storage module back into the intercepting sewer.

Although this is a pilot plant project, we assume that some additional good will be done to the Choptank River from this project.

Cambridge, Maryland is in a very fortunate position of being small and having not yet been smothered by the population growth which has engulfed other sections of the United States. We say that we are in a fortunate position because there is still time in our community and in our Eastern Shore area to save this great natural resource for future generations. There are many actions which must be taken within the next decade in order not to create the same condition here that has been created in the Great Lakes and in many areas along the East Coast of the United States where pollution has become an almost uncontrollable problem. A great deal of management know-how will have to be derived to prevent the buildup of the land into septic tank communities along with the overuse of chemicals and insecticides which will drain off into the rivers, poisoning all forms of water life. Other methods of land development use must be practiced, with a large scale control mechanism, in order to prevent the overall despoilage of this river and others like it in this area.

We would strongly recommend among other programs that Federal legislation be considered towards the separation of the sewers and stormwater systems which plague other cities as old as Cambridge, Maryland. The physical separation of the systems in these old cities as in Washington, D.C. is a monumental program; however, utilizing all the facets of the American technology, there must be other methods available for the use of the communities which would reduce this cost from the projected 50 billion dollars a year estimated by some scientists. We have applied for funds under existing acts for sewer, stormwater separation and grant money from the Federal government, and find that criteria established at the highest administration level make it appear that the separation is not a physical one, but is the building of new sewers which is not the case. We have been very disappointed in this program.

Another matter which must be eliminated in the forthcoming years is the discharge of sanitary waste from boats using municipal and rental yacht basins along the Bay and tributaries thereof in the State of Maryland. Sometimes large regattas and other gatherings of boats are using the Municipal facilities in Cambridge, and we find that the E Coli counts are extremely high off the mouth of these basins. Some method must be devised to provide proper disposal facilities on boats which are tied up in enclosed waters.

With the vast population explosion in the Boston to Richmond corridor there has been a large reduction in waterfront and water sport facilities on the East Coast. We on the Eastern Shore of Maryland have been extremely fortunate in this respect as we have not felt the dynamic effect of this boat population explosion to the extent which has been felt elsewhere. However, this picture is changing rapidly and there are a great deal of boat buyers and boat users from the Metropolitan areas now moving into the Eastern Shore to store and utilize the boating and fishing facilities here.

The Choptank River is by far the greatest economic asset which Cambridge, Maryland, has at the present time. We hope to continue to fully utilize it and highly recommend that the Department of Interior undertake any and all programs of research and estuarine management which will maintain and enhance the value of the waters of this area.

We thank you for giving us the opportunity to present this paper to you.

STATEMENT OF MR. ROBERT WARE STRAUS, EXECUTIVE VICE PRESIDENT OF THE ACCOKEEK FOUNDATION, INC.:

I have been struggling with the problem of increasing pollution of the Potomac River Estuary for 27 years.

As the only river commuter, I probably have as much daily contact with this great natural resource as anyone in the area. I am keenly aware of its continued deterioration, and am daily aware of whether the sewage plants are operating or not operating.

I would like to qualify myself further for the following statement on rivers and estuaries.

For a quarter of a century, I served as consultant to the Inter-State Sanitation Commission in New

York, New Jersey and Connecticut. During that time, I gained considerable acquaintance with estuaries, pollution control and river management.

Therefore, I was astounded, when last spring, the Department of the Interior in response to a Presidential request to make "the Potomac a national river" set up a proposed piece of legislation to accomplish that purpose. The legislation covered a most curious river -- one that started at Cumberland, Maryland, and stopped a hundred miles up from the mouth at the end of Tidewater. It omitted the Estuary entirely.

Inquiries to the Department of the Interior brought the startling answer that "we don't know anything about the Estuary of the Potomac".

Therefore, this Foundation welcomes the invitation of the Interior Department to present our point of view.

The Accokeek Foundation has a continuing interest in the proper management of the estuary.

The Foundation created a decade ago under the leadership of The Honorable Frances P. Bolton is chartered "to preserve and protect an area of great natural beauty along the Maryland shore of the Potomac River for scientific and educational purposes for the people of the nation". In carrying this out, we presented to the Federal Government and the Department of the Interior earlier this year over half of a 6½ mile stretch of the river shore as the basis for the new Piscataway National Park.

The polluted estuary and waters which wash, if that term can be used, the shores of this new park and the algae bloom which render the river bright green and foully odorous in the summertime hardly help us in our chartered purpose or the people of the nation.

We are interested in the estuary and we have some suggestions which may be of help to those working on it.

The first question to ask is "Why is the estuary different from the rest of the river system?" The ready answer is the estuary of the Potomac, in addition to all its other attributes as part of the Potomac River system, is used for navigation and the basis of a fishing industry.

This puts it in an area of uncontested Federal interest. This is important. It has been my experience in most river work that the question always rises among the State legislators and the national legislators who represent the State, "What is the Federal government doing in our river?"

National and international trade and the fishing industry are found by even the most ardent State's rights people to be firmly imbedded in the constitutional powers of the Federal government.

Therefore, the place to start with Federal interests in river systems is in the estuary.

In the second place, the estuary receives all the sins of the rest of the river system. If we, in the estuary, and those interested in estuaries can stop our esteemed neighbors from passing us all their problems and leaving it up to us at our expense to try and correct them, we will have gone a long way toward the systems approach which is so popular now.

You will notice I have carefully avoided the word studies. I also have avoided the suggestion of further conferences. In the third of the century I've been interested in estuaries, most of them could have been filled in with the studies and conferences that have been held. I think now we should turn to a much tougher approach. We all know that the way to stop pollution is to stop pollution. If you don't let it into the river, you don't have to take it out. Stop dealing in percentages of removal and deal in absolute pounds. Make the penalties stiff and enforce them.

Far more crowded areas of the earth than ours have clean rivers. I am finding more and more that the people who live along the estuaries and who depend on the estuaries for various facets of their lives are far in advance of governmental units that are supposed to be doing something about this. It is the citizens, through their organizations, that are moving.

The Potomac, of all the rivers in the country, should be the model to which these groups can look. I believe the steps are already under way to correct the shortsighted legislation proposed by the Interior Department and to include the estuary in the river and to provide the means of making it available to the millions who live along it.

The Potomac has always been a pioneer river. It early became and still maintains leadership as one of America's most polluted streams. For that reason if no other, it has the best chance in the world to become a laboratory to develop the river of the future. The Accokeek Foundation wants your help in making it the river of the future.

MR. JENSEN: I think in closing that, unless there are other statements from the audience, I would certainly like to thank all of you for your attention and your participation. I certainly want to extend my personal thanks to the members of the Panel and my thanks to the agencies as well for your cooperation.

I think the statements and the comments that have been developed today will certainly complement those which were developed and given at the Governor's Conference on the Chesapeake Bay. These two meetings together certainly should go a long way towards setting the stage for a future action program in the State of Maryland.

Finally, I want to thank Mr. McKee and Mr. Brink for their assistance in organizing this conference. It never could have been held without them.

It is the sort of thing a Federal agency finds itself almost unable to do by itself.

On behalf of the Water Pollution Control Administration, at least, I thank each and every one of you.

DR. CRONIN: This conference isn't held quite for that purpose. It is held to accumulate statements, but it seems to me there is a healthy suggestion for annual Governor's Conferences or biennial or whatever pattern may emerge. It would be fine if once every year or two an appropriate panel did convene simply to respond to any questions of anybody.

MR. JENSEN: If there are no further comments, I will declare the meeting to be closed.

(Whereupon, at 5:40 p.m., the meeting was adjourned.)

ADDITIONAL
STATEMENTS SUBMITTED
FOR THE
RECORD

Statement of the Maryland State Planning Department to the Federal Water Pollution Control Administration Public Meeting on the Chesapeake Bay - October 30, 1968 St. John's College, Annapolis, Maryland

The State Planning Department - with the possible exception of some aspects of the on-going Wetlands Study to be discussed later - has no specific resource management responsibility. However, we hope to suggest, in this statement, a broader policy and administrative background against which more specific resource problems might be considered.

Maryland considers the Chesapeake Bay its greatest natural resource. However, the Chesapeake Bay system consists of the Susquehanna, Potomac and other tributary streams. Thus, the hydrologic integrity of the Chesapeake Bay extends beyond the borders of the State itself.

The hydrologic and biologic integrity of the Chesapeake Bay system has been increasingly recognized by Maryland. Over the years, the benefits and values of the Chesapeake Bay have been shared by the State with our neighbors and visitors. It is now evident that the "costs" of maintaining this asset must be shared as well.

Costs are not necessarily direct and financial in nature. They can be the costs incurred in taking account of the needs of others as realized through policy, plans and administrative action and regulation.

As the relationship between the hydrologic and biologic integrity of the Chesapeake Bay system comes into sharper focus, it is becoming clearer that one of the greatest challenges facing the management of this estuarine area is developing a means for sharing in the "costs" of management. Recognition of hydrologic and biologic integrity must lead to an appreciation of the administrative system with which we must deal. The Susquehanna and proposed Potomac River Basin Compacts represent an attempt to define the administrative integrity of the Chesapeake Bay system.

The Susquehanna River Basin Compact has been approved by the states of Maryland, New York and Pennsylvania and now awaits action by the United States Congress. During the course of deliberation between the three states, the matter of relating the Chesapeake Bay to the Susquehanna River was fully discussed. The Compact provides that "the comprehensive plan shall take into consideration the effect of the plan or any part thereof upon the receiving waters of Chesapeake Bay." For administrative purposes, the Compact specifies that the Pennsylvania Railroad Bridge crossing the Susquehanna River near Havre de Grace, Maryland shall be the southern terminus of the Compact organizations jurisdiction. This point of demarcation allows Maryland to represent the needs of the Chesapeake Bay system within the spirit of the Compact without involving the State of Virginia (in which part of the Chesapeake Bay lies) which has only a limited concern with water resources management and development in the Susquehanna River Basin itself.

A similar relationship has been proposed in the Potomac River Basin Compact. The Compact provides that "with respect to any action taken by it under this Compact, the Commission shall consider the actual or potential effect of such action upon the receiving waters of the Chesapeake Bay." In the case of the Potomac Compact the administrative demarcation point marking the terminus of the Potomac Basin is along a line from Point Lookout, Maryland to Smith's Point, Virginia. In this instance, the States of Maryland and Virginia are able to represent the needs of the Chesapeake Bay.

The administrative system outlined has direct implications on the nature and purpose of plan development now underway by the Corps of Engineers and Susquehanna River Basin Coordinating Committee. As a participant in this water and related land resources planning effort, the State has continuously sought recognition of the relationship between fresh-water inflow into the upper Bay and the well-being of the Bay's ecologic and hydrologic system. Action to deepen the C and D Canal must also be related to on-going Susquehanna water resource development and management. Recent correspondence (June 17, 1968) between James J. O'Donnell - former Director of the Maryland State Planning Department - and Rodney Resta, Executive Secretary of the Susquehanna River Basin Coordinating Committee, Corps of Engineers dealt with these issues. (Attachment I) In part, the State Planning Department indicated:

> "Maryland is most concerned with ensuring that an ample supply of water remains available for domestic usage in Cecil, Harford and the Baltimore metropolitan area and that the fresh water input to the Chesapeake Bay is not diminished in quantity and periodicity from that judged to be in the interest of the ecological well-being of the Chesapeake Bay System...
>
> "/T/he effect of present deepening of the C and D Canal would bring a significant increase in outflow of water from the Upper Chesapeake Bay into the Delaware Estuary. Such a situation could disrupt the fresh water flow regimen between the Susquehanna River and the Bay... (and) could conflict with one of our principal objectives - protecting the present ecology of the Chesapeake Bay system until such time as controlled management can be established."

Three principal policy considerations can be directly attributed to the emphasis upon an administrative system for the Chesapeake Bay. These are:

1) Maintenance of a level of fresh-water inflow into the Upper Bay adequate to produce the salinity levels necessary to support the biologic productivity of the Bay.

2) Maintenance of a level of fresh-water inflow sufficient to compensate for any potentially disruptive diversion from the Upper Bay into the Delaware Estuary through a deepened C and D Canal.

3) Maintenance of a fresh-water inflow into the Bay which does not disrupt the circulation pattern within the Upper Bay and the flushing action on estuarine areas.

Related to the administrative system and the policy concerns associated with the hydrologic and biologic integrity of the Chesapeake Bay system is the proposed Corps of Engineers' hydrologic model for the

Chesapeake Bay. Maryland was an early supporter of this program and encouraged a strong and timely effort to initiate construction of the model. However, we are dismayed by the lack of financial and staffing support shown this effort by the Congress. It is abundantly clear to us that if we are to manage the Chesapeake Bay and implement a meaningful administrative system necessary to safeguard the hydrologic and biologic integrity of the estuarine system, it is necessary that the hydrologic model be available as a management and research tool for the State and Federal governments. Many of the policy and administrative considerations which will be faced are amenable to study and analysis with the hydrologic model. Attached for the record of this session are several papers dealing with estuarine management policy, hydrologic model, and the hydrologic and biologic integrity of the Chesapeake Bay system. (Attachments II, III, IV, V)

Apart from administrative systems and hydrologically related interstate water management problems, there is a series of major policy problems which for lack of a better nomenclature shall be called "habitat maintenance" policy. It will do well to list and briefly discuss these as they also reflect major management concerns of both an inter and intrastate nature.

1) The Chesapeake Bay shall be managed for multiple uses. However, a careful analysis of what multiple-use means must be made. Multiple-use under conditions of extensive and intensive resource use are not necessarily the same. Under conditions where the resource base is used extensively, multiple-use is of a passive nature. Where intensive use prevails, active management of multiple-uses prevails. The significant difference is that under intensive use conditions, there must be a conscious and deliberate effort made to administer, manage and regulate resource uses and the location of those uses. Passivity connotes a laissez-faire approach to resource management, whereas activeness indicates purposeful regulation of uses. The Chesapeake Bay is rapidly moving from the passive to the active state of resource use and management alternatives must be viewed and selected accordingly.

2) Shoreline land use is a critical factor in Chesapeake Bay resource use and must be managed and regulated. As the pressure on the resource base increases, active maintenance of multiple-uses dictates that the competition for shoreline land use be regulated. A necessary ingredient to accomplishing this task is a study of shoreline usage.

3) The location of heavy industry in estuarine areas must be governed by national policy and only secondarily by the states. Demands of the Nation's economy and industrial competition are, hand-in-hand, contributing serious disruptions to the biologic integrity of our estuarine systems. At present, we call upon our local officials to carry the burden of deciding on the location of such industrial activity. The impact of these decisions is much broader then the narrow base of a county or municipality. This is not fair to local officials and industry alike. A means must be provided for regulating the competition for estuarine industrial sites or else our estuarine areas will become obliterated in the name of free enterprise and state and local rights.

4) Channelization and spoil deposition must be more closely scrutinized. With the advent of larger draft ships and increasing port competition, the legitimate demands of navigation interests for deeper channels also creates a bigger problem with spoil deposition. As indicated previously, the impact of the C and D Canal is one example of how navigation can compete - unless regulated - with the biologic and hydrologic integrity of an estuarine system. Of more localized concern is where you deposit the spoil. This relates directly to shoreline land uses and management of marine resources.

5) The Chesapeake Bay will become a major location for thermal power generating facilities. This provides a unique challenge to combine regulated heated water discharge with nutrient rich waste effluent to generate a high level of fish farming in the Chesapeake Bay. It is time to develop the fuller potential of the Bay's marine resource so that new means of production and harvest can begin to share with the traditional harvesters and processors the wealth of these waters.

6) Dredging and filling of wetland, marsh and submerged lands must be regulated. These areas represent the habitat essential to spawning, feeding and protecting many marine life forms and contribute the basic micro-organism and nutrient enrichment to the ecologic system. Silt materials are stirred up by the dredging operation and/or the backwash of the fill and can blanket otherwise

> untouched bottom over a considerable area. Therefore, in addition to destruction to the dredged and filled areas there are waterborne destructive spillover effects in areas adjacent to dredge and fill operations. There is impressive evidence of the detrimental effect on the natural environment and dependent species in areas beyond the site of dredge and fill operations.*

Recently, the Board of Public Works - the State's top administrative agency composed of the Governor, Comptroller and State Treasurer - established a policy regulating the filling of the waters of the State. A developer is now required to provide to the State title to two (2) acres of marsh of similar value for each acre deeded by the State to the developer. In addition, the developer is required to pay into the State the going rate per ton (dryweight) for each cubic yard of fill removed from the submerged lands of the State.

The indicated "habitat management" policies of concern are not an exclusive list to be sure. However, they do provide the broader aspect of our estuarine management challenge and the context within which our more specific problems can be considered. Now, to return for a moment to the Wetlands Study underway in Maryland.

The 1967 Session of the Maryland Legislature enacted House Joint Resolution No. 2 calling upon the State Planning Department in cooperation with the Board of Natural Resources and the Department of Economic Development to undertake a study of Maryland's wetlands and to make recommendations for their management and protection. One aspect of our on-going study has been a legal analysis of the relationship between common law and statute and the ownership status of various wetland areas. (Attachment VI) The principal conclusions arrived at were:

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* See Marshall, A.R., "Dredging and Filling" in Proceedings of the Marsh and Estuary Management Symposium, 1968. pp. 107-113.

1) The general rule is that the State is the owner of land below mean high water.

2) Maryland's common law and general statutes recognize that both public interests and riparian rights and privileges are interrelated.

3) The relationship between the public interest and riparian rights and privileges in marsh and submerged lands patented, granted or titled must be clarified to protect the remaining public rights to navigation and fishing unless specifically restricted by statute.

4) Maryland common law and statute make clear that the various uses of tidal wetland, marsh and submerged lands are privileges granted by the State and not common law riparian rights without limitation. Dredging and filling such land is certainly not a right of unrestricted dimension.

5) Tidal marsh and bottom are directly affected by common law and the existing statutory concern for the public interest.

6) The critical interrelationship between the biologic and ecologic values of tidal waters, shoreline and bottoms under the protective responsibility of the State requires an administrative procedure capable of fully weighing proposed shoreline and bottom use changes and the effects on the public interest and resources of the State.

7) The public interest in non-tidal salt marshes has not been defined in common law and statute.

8) Maryland common law and statute ascribes to the doctrine that the protection of marine resources is a public purpose.

9) The doctrine of protection of the marine resources as a public purpose has been used by other states as a legal basis for applying the police powers to restrict land use and acquire wetlands by condemnation or other means.

10) There is a clear need to refine and tighten the policy and procedures governing the State's jurisdiction and disposition of actions affected with the public interest in tidal marsh and submerged lands.

In addition to the foregoing legal analysis, special mention should be made of the effort underway to establish a system for effectively handling the large volume of data and information generated by the study of Maryland's wetlands and related estuarine areas. The approach measured to achieve this objective is an automatic data processing information retrieval system designed especially for wetlands. We are attempting to apply and adopt the capabilities of computer science to wetland/estuarine area problems and management decisions. Discussion in greater detail of the wetlands information retrieval system currently under development is provided in Attachment VII.

In summary, the Chesapeake Bay is part of a larger hydrologic and biologic system. It is within an administrative system affected by interstate decisions, but also has all the unique and pressing policy and management problems of an intrastate resource. The Chesapeake Bay is an asset - it is Maryland's greatest natural resource. Benefits are shared with all who visit and rely on the Bay. It is now time for everyone to recognize that the "costs" of managing this estuary be shared equitably amoung users. Until the hard-nosed fact of life that active multiple-use of this resource and other estuarine areas requires a concerted effort to formulate meaningful policy and sound administrative action and regulation, the future of this significant non-renewable natural resource will be one subject to serious challenge and constant warfare. Current wetland study activities of the State Planning Department will aid in the resolution of some use conflicts. With land values as they are now, we simply cannot afford to build new estuaries after we have bargained and compromised existing ones away.

ATTACHMENTS

I. Letter dated June 17, 1968 from James J. O'Donnell - former Director Maryland State Planning Department-to Rodney Resta, Executive Secretary Susquehanna River Basin Coordinating Committee - U. S. Army Corps of Engineers.

II. "Developing and Managing Estuaries." Atlantic States Marine Fisheries Commission. October 7, 1966.

III. "Management Tools for the Susquehanna River - Chesapeake Bay System." Maryland State Planning Department. January 1967.

IV. "A Preliminary Estimate of the Effect of Diversion of Flow from the Susquehanna River on the Salinity of the Upper Chesapeake Bay." Dr. Donald W. Pritchard. October 1966.

V. "Chesapeake Bay Water Supply Needs - The Biological Point of View." Dr. L. Eugene Cronin. October 4, 1966.

VI. "Maryland's Wetlands, Marshes and Submerged Lands in the Context of Common and Statutory Law." Robert M. August. Maryland State Planning Department. October 1968.

VII. "Planning the Management of Maryland Wetlands." Roy G. Metzgar (Maryland State Planning Department) and David A. Wharton (Department of Game and Inland Fish). October 20, 1968.

STATEMENT OF HONORABLE EDWARD A. GARMATZ, CHAIRMAN, HOUSE COMMITTEE ON MERCHANT MARINE AND FISHERIES, AT PUBLIC HEARING ON ESTUARINE AREAS HELD IN ANNAPOLIS, MARYLAND, OCTOBER 30, 1968, CONDUCTED BY THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DEPARTMENT OF THE INTERIOR.

The preservation and development of our Nation's invaluable Estuarine areas should be of vital concern to all Americans, and I am grateful to be able to participate in this dialogue.

As Chairman of the House Committee on Merchant Marine and Fisheries, I am quite naturally concerned about any national program affecting estuarine areas. One very important reason for my concern is this: 80 percent of the total United States fisheries products are caught within twelve miles of our shores; furthermore, 90 percent of the fish that comprise that total, at some point in their life cycle, are dependent upon the estuaries for spawning, food supply, habitat or some other vital life function.

There are, of course, many other reasons why these precious wetlands should be protected and maintained. Yet, despite their inestimable value -- in addition to their great natural beauty -- very little is really known about them. It is my understanding that the purpose of these hearings is to correct this ignorance by preparing a report to Congress which would contain recommendations for a national program for the preservation, study, use and development of the Nation's estuarine areas - with special emphasis on the

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problem of pollution. Such a broad-ranging program is badly needed, and I commend the Department of Interior for taking concrete action.

I am proud to note that some Congressional action has already been initiated, through the enactment of Public Law 90-454. This law, which evolved from H. R. 25 and was enacted August 3, 1968, provides for a study to determine which estuaries are important enough to be protected under a nationwide system of estuarine areas.

Unfortunately, many valuable and beautiful estuarine areas have already been destroyed through the relentless expansion and encroachments of industrialization, land development and pollution. Such losses are tragic, since once these areas are destroyed, they are gone forever. Certainly, the adverse impact of our ever-expanding economic and industrial culture must somehow be softened and controlled. This problem raises a serious question involving conflicts of basic philosophical differences between the conservationists and the industrial community. The question is: How far should we go in our justifiable attempts at conservation, without impairing or impeding the progress which is so vital to our entire economic and social system? Admittedly, this is a difficult and sensitive controversy, which has caused problems in the past and

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will -- I am sure -- continue to harass us in the future.

Recognition of this basic conflict is apparent in the language of Public Law 90-454, which, in part, is as follows:

"It is therefore the purpose of this Act to provide a means for considering the need to protect, conserve and restore these estuaries in a manner that adequately and reasonably maintains a balance between the national need for such protection in the interest of conserving the natural resources and natural beauty of the Nation and the need to develop these estuaries to further the growth and development of the Nation."

I am personally aware of the problems caused by these conflicting interests, since my Congressional District represents a portion of Baltimore City -- including the great seaport of Baltimore -- and the northern section of Anne Arundel County. The great Chesapeake Bay is one of Maryland's greatest natural resources; its waters have given my State a rich heritage of wild life, as well as a great seafood industry. It is natural, therefore, that conservation interests are vitally concerned with protecting and preserving the existing estuarine areas, which play such an important and beneficial role in the total ecology of the Bay and its marine life and wildlife. Conversely, maritime interests and industry-oriented businesses are more concerned with utilizing these uninhabited areas to promote and expand their own activities.

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Paradoxically, both of these conflicting interests have a legitimate argument, since both represent areas of activity which make important and essential contributions to the State of Maryland.

I know that similar conflicts can be found across the nation, especially along America's great coastal areas, where large estuarine networks are found. I was made especially aware of these differences while my Subcommittee on Fisheries and Wildlife Conservation was holding hearings on H. R. 25. In the beginning, that bill heavily favored the conservationists. As the hearings progressed, however, strong opposition to the legislation emerged, and all my Committee members realized that a better balance -- a compromise, if you will -- was needed if the legislation were to be successful. The bill that was finally reported out by my Committee was far different than the original, and it represented a sincere Congressional attempt to present a balanced and reasonable piece of legislation that both interests could accept.

Balance is the key to any successful program involving our estuarine areas. We must continue to maintain an intelligent, practical and, above all, reasonable balance between the various interests. Wherever possible, local governments should administer programs and govern the utilization of valuable estuaries. This

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is especially important, in view of the fact that the needs and the natural resources vary considerably in various regions of the United States. As I see it, the role of the Federal Government in the overall estuarine problem should be one of consultant and arbitrator between conflicting interests. But the Federal Government must of necessity also become actively involved, since National interests -- as well as regional interests -- are at stake.

Man is a great creator, but he also destroys. His constant expansion and increased industrialization brings great progress, but it also brings mammoth problems, such as pollution. Despite the current hue and cry, there is no concrete evidence of pollution being abated. Every community and municipality is happy to see a new industry move in, or a new housing project developed. This is progress, and is certainly a boon to the economy of that community. But each new industrial expansion or encroachment also brings additional pollution. In each individual case, it must be decided if the loss of natural resources -- such as estuarine areas -- is compensated sufficiently by the economic gain. Such decisions can not be intelligently made, unless more is known about the estuarine area, and its total value and importance to the community, the State and the Nation. Hopefully, studies such as the one now being conducted by the Department of Interior will help us to make the right decisions. We can not afford to make many wrong ones.

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Statement of National Capital Planning Commission*

Regarding the Potomac River Estuary

National Estuarine Pollution Study Hearing

Annapolis, Maryland

October 30, 1968

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*The National Capital Planning Commission was created by the National Capital Planning Act of 1952 to supersede the National Capital Park and Planning Commission. The Commission is the planning agency of the District of Columbia, and it serves as the central planning agency for the Federal and District of Columbia governments within the National Capital Region.

We are pleased to have the opportunity to appear at this meeting, which could have a significance impact on our Nation's Capital. The National Capital Planning Commission has a long history of interest in water pollution, dredging and filling of the Potomac River. This not only includes those items directly under the sphere of the Commission but at numerous hearings of Congress and other agencies regarding programs to improve the quality of the total environment of the Potomac Valley.

The National Capital Region includes Montgomery and Prince Georges Counties in Maryland; Arlington, Fairfax, Loudoun and Prince Williams Counties in Virginia, and the District of Columbia. The present population of the region is 2,840,000 (July, 1968 estimate); expected to be 3,700,000 by 1985, and over 5 million by the year 2000. The problems of today can be expected to double in the next 30 years, in regard the effects of the population on the Potomac River Estuary, because of growth and development potential. The need for water of suitable quality for recreation purposes will become increasingly important.

In 1966, the National Capital Regional Planning Council prepared the Regional Development Guide, 1966-2000 and identified certain policy goals in regard to the Potomac River which directly affects the estuarine environment. These policy goals for the Region are now undergoing study by the Metropolitan Washington Council of Governments as part of their Regional Planning program. They are being used as a general guide by both COG and the National Capital Planning Commission in their current planning efforts. The following policy objectives are deemed as important to the National Estuarine

Pollution Study, in regard to the Potomac River.

Water Quality[1]

POTOMAC RIVER

Monocacy River to Key Bridge

Objective: The establishment of conditions suitable for water supplies, swimming, fishing, boating, shore recreation, and safe for all species of fish life with favorable conditions prevailing for their propagation.

Standard: Monthly median MPN Coliform per 100 million parts not to exceed 2,000. Monthly median Dissolved Oxygen in mg./l not to be less than 6.5.

Method: The elimination of sewage and waste effluent and excessive soil erosion.

Key Bridge to Fort Washington

Objective: The establishment of conditions suitable for boating, shore recreation, industrial water supply, and safe for the passage of all types of fish, with favorable conditions prevailing for the propagation of hardier types.

Standard: Monthly median MPN Coliform per 100 ml. not to exceed 10,000. Monthly median Dissolved Oxygen in mg./l not to be less than 5.0.

Method: Reduce the quantity of combined sewage discharge and control the quality of waste effluents by effective treatment. (See standards for treatment facilities.)

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[1] Source: Wolman, Abel, and John C. Geyer, Report on Sanitary Services and Waste Water Disposal in the Washington Metropolitan Region, Baltimore, See also: U.S. Army Corps of Engineers, Potomac River Basin Report app. E, pp. 557-578 footnote.

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Fort Washington to Hallowing Point

Objective: The establishment of conditions suitable for boating, swimming, and shore recreation.

Standard: Monthly median MPN Coliform per 100 ml. not to exceed 2,000. Monthly median Dissolved Oxygen in mg./l not to be less than 6.0.

Method: Reduce the quantity of combined sewage discharge, and control the quality of waste effluents by effective treatment. (See standards for Treatment Facilities.)

OTHER STREAMS IN THE NATIONAL CAPITAL REGION

Streams Used for Water Supply

Objective: The establishment of conditions suitable for water supplies (no treatment except chlorine), swimming, boating, shore recreation, and safe for all species of fish.

Standard: Coliform Bacteria: 0-50

Color, ppm: 0-10

Turbidity, ppm: 0-10

pH: 6.0-8.0

Dissolved Oxygen: 6.5 minimum
7.5 average

Other Conditions: No toxic substances, oil tars, or free acid at any time. No floating solids or debris except from natural sources. No taste or odor-producing substances.

Minimum Standard for all Other Streams

Objective: The establishment of conditions suitable for swimming, boating, shore recreation, and safe for all species of fish.

Standard: Coliform Bacteria: 50-100 monthly average
1,000 maximum

Color, ppm: 20

Turbidity, ppm: 40

pH: 6.0-8.5

Dissolved Oxygen: 6.5 average
5.0 minimum

Other Conditions: No toxic substances, oil tars, or free acid at any time. No floating solids or debris except from natural sources. No taste or order-producing substance.

Sanitary and Storm Sewage Collection and Disposal

To achieve the desired standards of water supply and quantity, there must be a coordinated regional system of sewage collection and treatment facilities.

These facilities will have a profound effect on land development patterns. Interceptors, trunk sewers, laterals, and other elements of the collection system should be designed to provide maximum coverage in accordance with regional and local general plans. Local governments should adopt a general policy providing for limited access of trunk sewers through open-space areas and draft and promote enabling legislation for the achievement of that policy.

To meet the desired water quality objective, these sanitary sewage treatment standards should be applied:

1. Facilities should be consolidated whenever possible to provide the most complete and efficient treatment.
2. Facilities should be capable of expansion.
3. Facilities should be isolated from residential and commercial areas.

4. Treatment plants with outfalls in the upper Potomac Estuary should provide a minimum of 85 percent removal of B.O.D. by the year 2000, with sufficient removal of fertilizing mineral such as nitrogen and phosphorus to minimize aquatic blooms. Streamflow must be adequate to maintain an acceptable dissolved oxygen content.
5. Treatment plants with outfalls in the upper Potomac Estuary should provide a minimum of 80-percent removal of B.O.D. by the year 2000 with chlorination of effluents where plant outfalls are in the vicinity of recreation areas. Streamflow must be adequate to maintain an acceptable dissolved oxygen content.
6. Low-flow augmentation of the Potomac River must be considered to insure adequate assimilation and disposal of the treated effluents discharged into it.

For septic tank systems, these specific policies are recommended:

1. Small lot-size subdivision development should be allowed only where a central sewerage system is or will soon be available.
2. Septic tanks may be permitted only if soil conditions are suitable and if a central sewer system is assured in the very near future.
3. A developer using septic tanks should be required to install a complete sewerage collection system that can later be connected to the central system there is no alternative on-site disposal, lot size and design should permit periodic reconstruction of the disposal system when failures occur.
4. Purchasers of property using on-site disposal should be informed of this fact by notation on the deed or other legal document required in property transfer.

The following specific policies are essential to the provision of a safe and efficient storm drainage system:

1. Storm sewers should be provided wherever necessary for the public health, safety, and welfare.
2. Storm sewer design should account for the population to be served, the shape and area of the watershed, ground shape, the character of the ground cover, and rainfall intensity.
3. Natural drainage courses should be preserved with channel rights-of-way adequate for a 25-year storm.
4. Small dams and silt reservoirs should be provided wherever necessary.
5. Adequate provision must be made for the effects on lower stream basins of storm water originating in upper basins.

Hydrological Conservation and Development

Water is an essential element in the great majority of conservation programs. The primary objectives of hydrological open space are: comprehensive watershed management--including water storage and water supply; forest and grassland maintenance; runoff retardation; sediment abatement; soil conservation; flood control--including stream regulation conservation storage, and ground water recharge; recreation--all water oriented recreation; and fish and wildlife--preservation of natural habitants.

As a policy, conservation treatment of these lands should generally be in the form of regulative cover. This determines to a large extent the rate at which water carries the soil and influences the amount and rate of surface runoff and thus determines soil erosion and sedimentation.

As basic policies: (1) No development should occur on slopes of over 25 percent--these lands should be planted in forest cover; (2) only "open-space" residential uses should be permitted on slopes from 15-25 percent with 5-acre minimum suggested lots sizes; these areas should also be predominantly forested; (3) where higher density development does occur, it should be well related to soil types (see section on soil conservation) and its effect on surface runoff (see section on sediment abatement).

Sediment Abatement

Sediment presents the following problems in the use of streams and other water bodies: (1) Floods--sediment deposits reduce the carrying capacity of floodways and flood plains; (2) storage capacity of reservoirs--sediment accumulation reduces storage capacity and may evenutally make channel depths and increases the need for dredging operations; (4) water supply--suspended sediment reduces water supply quality and necessitates treatment to remove it; (5) recreation--suspended sediment can make water unsuitable for swimming and boating; (6) fish and wildlife--sedimentation can make waters unfit for animal life.

The amount of sediment in a stream is essentially a function of natural factors, such as precipitation, geology, and soils, and factors controllable by men, essentially land use.

The higher the form of land development, generally the larger the production of sediment. In the Potomac River Basin, sedimentation increases directly with the amount of land in crops and inversely with the amount of land in forests.

Urbanization, with increasing construction activity, greatly increases sediment discharges.

Where sediment abatement is necessary to make full use of a water resource, these steps should be taken: (1) Reduce water runoff (see above section); (2) control development by limiting densities and construction activity above the resource-use area; (3) construct sediment control structures to catch and store sediment before it reaches resource-use areas; and (4) design reservoirs to account for expected sedimentation.

Flood Control

Generally, the frequency and severity of floods can be reduced by:

(1) Decreasing Flood Runoff. Water runoff control can be an important measure in reducing flood severity of headwater tributaries and small streams. It is of dubious value in ameliorating major river basic-wide floods. The primary method of decreasing runoff is through soil conservation and the assurance of adequate soil cover.

(2) Increased Channel Capacity. Channel capacity can be increased by dredging and lining the channel to reduce water friction by preventing obstructions in the floodway and floodplain. Moreover, the effects of runoff of adjacent streams should be analyzed and steps taken to assure adequate channel capacity--especially since soil runoff increases where urban construction is taking place.

(3) Restricting Development. Where adequate channels for the movement of floodwaters are not deemed feasible, development in flood plains should be restricted to preserve stream capacity and prevent property damage--especially in the urban ring and centropolis.

(4) Reservoirs. Reservoirs are often used to catch floodwaters to

store excess runoff, and to discharge it gradually. Flood prevention reservoirs can also aid sedimentation control and provide recreation. These two functions should be designed whenever possible in designing flood-prevention reservoirs and adjacent areas.

Scenic Resources

Scenic areas are large sites with natural attributes unique in the National Capital Region. An example would be the palisades bordering the Potomac River.

Scenic areas are a valuable regional asset. They add desirable amenities to the Region, give the Region identity, and provide a sense of orientation. Once lost, they can never be replaced.

Often scenic areas have sentimental value which can be used to arouse public support for their preservation. In this sense, they can also be used to serve other open-space purposes, especially structural open space.

Policies for preserving scenic areas include special codes, regulations easements, public purchase of development rights, or outright purchase.

Vistas and views are open space visible from roads and other public places--usually ridges, bluffs, and slopes. This type of open space can significantly increase awareness and enjoyment of the environment.

For conservation purposes these areas should usually be kept undeveloped or in low-density development. These areas should be provided with convenient parking areas, overlooks, brief descriptive signs, and trimming of foliage blocking the view.

Recreation

The Potomac Estuary and the Chesapeake Bay, as well as their major tributaries, possess an infinite amount of recreation potential. They are spacious and relatively safe, and support a wide variety of sport fish. Extensive areas of marsh and wetlands provide valuable habitats for nesting, wintering, and migrating waterfowl. A major problem in the region, and one that now is a major deterrent to water recreation, is the amount of pollution present in many of these waters. Untreated or partially treated effluents, both from urban and industrial waste, make many areas unhealthy and unattractive for swimming or water skiing and pleasure boating and fishing are also adversely affected.

The second major deterrent to a full realization of water recreation in this area is the lack of places where the public can gain access to the water and beaches. Unfortunately, the great recreational potential of the waterways is not reflected in a comprehensive system of waterfront parks in the National Capital Region.

It is vitally important to the National Capital Region that policy objectives similar to those discussed above be made part of the National Estuarine Pollution Study for the Potomac River. The objectives of the Clean Water Restoration Act of 1966 are important to the goals of the Potomac National River Bill which is attempting to "serve as a model of scenic and recreation values for the entire country," to quote President Johnson on this matter.

This Commission wholeheartedly supports the current program of improving our estuaries and urges that concrete objective be developed to this end. We would be happy to cooperate, to extend the possible, in furthering the important work being undertaken to develop a rational program to protect a valuable and unique resource.

CHARLES A. DOCTER
DISTRICT 2
MONTGOMERY COUNTY
CHAIRMAN
MONTGOMERY AND PRINCE GEORGES
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October 25, 1968

Mr. Eugene Jensen
Regional Director, Middle Atlantic Region
Federal Water Pollution Control
918 Emmet Street
Charlottesville, Virginia

Dear Mr. Jensen:

Many thanks for your letter of October 4, 1968. Unfortunately, I shall not be able to attend the meeting in Annapolis on October 30th and 31st. However, I would appreciate your considering this letter at your meeting.

It is almost impossible today for responsible people to remain unaware of the seriousness of our water pollution problems in the State of Maryland. As one vacations anywhere in the state, we see the invasion of the estuarine environment in particular. We see the Chesapeake Bay area threatened by possible thermal pollution from atomic plants; we see that the Potomac may be threatened by pollution from oil refineries; and, we see the Atlantic coastline threatened by land fills. As one drives along the Ocean City area, we see the wetlands being dredged and filled up and down the coast. At great cost to our fish and bird life, neat canals with bulkheads are appearing where before there were marshes and small bays. The pressure to reclaim the land will become greater as population pressure rises in the vacation spots. Land will be filled and more canals dredged to reclaim the land with the danger that proper consideration will not be given to the watershed and the estuarine relation to the continental shelf. We give indications of tampering with our environment like irresponsible children; uncaring and unaware of possible serious disturbances to follow.

In considering the problem of dredging and filling the estuarine, it must be remembered that a great number of all our fish and two-thirds of all our shellfish must spend the vital part of their life cycle in the estuarine zone. We cannot afford to wipe out fish in such huge numbers -- with the fish will go the birds and waterfowl. The dredges have on occasion been observed using scoop methods, dragging along the sea bottom, destroying the breeding ground of countless thousands of fish and shellfish. All of this vital

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estuarine breeding zone is being destroyed in the name of "land reclamation." We are not Holland--we are not a land poor country. I think we should preserve the estuarine; this is a heritage to our future generations that we must preserve.

The "wetlands" are a precious part of our heritage, and must be preserved from the depredations of unwise development--even though it may appear as a possible new tax revenue. We must face squarely the crucial question of whether local government should sell valuable natural resource areas to developers, especially without even controlling the dredging and filling process. This poorly understood of our environment where lands meet the sea deserves further study before it is too late.

Sincerely yours,

Charles A. Docter

CAD:bes

problems of man-made pollution in the Potomac estuary be eliminated as rapidly as possible, and that all feasible effort be expended to prevent the development of similar problems in the Patuxent estuary.

The governments of the metropolitan area have not been lacking in the past in their concern for the problems of their estuaries, and great effort has been expended in the struggle to keep pollution control facilities abreast of the needs of a continually growing population. In recent years, as it became more and more obvious that the complex and largely unknown phenomena of the estuarine environment would need to be considered carefully and taken into account in the design of pollution control facilities was to be wisely spent, two of the metropolitan area governments undertook action to help bring about understanding of the problems of the Potomac estuary.

In 1965, the District of Columbia Department of Sanitary Engineering and the Department of Health of the State of Maryland jointly employed a group of water resources consultants from the Johns Hopkins University and the University of Georgia to identify those factors in the estuarine environment which would subsequently require consideration in the design of treatment facilities, and to suggest study programs which might help bring about greater understanding of the nature and influence of those factors. Since the receipt of the report of those consultants, the Federal Water Pollution Control Administration, working with the Federal Interdepartmental Task Force on the Potomac, has been independently carrying out its own investigations of both the Potomac and Patuxent estuaries. Within the past three months, a special subcommittee of the Sanitary Advisory Board of the Council of Governments has been working with FWPCA to ascertain the degree to which the results of the Federal studies provided answers to questions raised in the consultant's report, and to examine the implications those results might have for present or future pollution control facilities needed for the Potomac estuary, or by extension, for the Patuxent estuary.

While it would be premature to anticipate the final report of the Sanitary Advisory Board sub-committee, we do expect, once that report has been reviewed within the Council of Governments, to be able to make several recommendations concerning additional efforts that should be made to eventually bring about more effective control of existing and potential pollution in the Potomac and Patuxent estuaries. We hope that your agency will remain receptive

metropolitan washington
COUNCIL OF GOVERNMENTS
1225 Connecticut Avenue, N.W., Washington, D. C. 20036 223-6800

October 28, 1968

OCT 29 1968

Mr. Eugene T. Jensen
Regional Director
Federal Water Pollution Control
Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Va. 22901

Dear Mr. Jensen:

Thank you for your letter of October 4 concerning the public meeting on estuarial problems affecting Maryland and the District of Columbia to be held in Annapolis, Maryland, on October 30.

The Metropolitan Washington Council of Governments regrets that it will be unable to have a representative in attendance at that meeting. However, it is very much concerned with the problems of the two estuaries, the Potomac and the Patuxent, which lie within the region it serves, and we are therefore taking the opportunity, by means of this letter, to offer remarks for inclusion in the record of that meeting.

As you may know, the Metropolitan Washington Council of Governments is an organization of the elected and presidentially appointed governing officials of the local governments in the Metropolitan Washington area. The jurisdictions concerned are listed across the bottom of this page. In addition, our membership also includes the members of the regional delegations to the Congress and to the Maryland and Virginia General Assemblies.

The present problems of the Potomac Estuary, or more properly, the Potomac tidal river, are unfortunately too well-known to require further amplification here, and we are now informed that the Patuxent tidal river is also being threatened by the potential occurrence of similar difficulties. We believe that it is essential that the

OCT 29 1968

to any recommendations that may subsequently be forthcoming.

We thank you for the opportunity of making this statement, and regret that we will be unable to be personally in attendance at the public meeting on October 30.

Very truly yours,

Francis B. Francois, Chairman
Environmental Health Policy
Committee and
Vice Chairman
Prince George's County Board of
County Commissioners

MARYLAND - VIRGINIA COMPACT 1958

POTOMAC RIVER FISHERIES COMMISSION
P O BOX 128
COLONIAL BEACH VIRGINIA 22443

Copy of Resolution adopted by the Potomac River Fisheries Commission at its regular meeting held Tuesday, September 10, 1968, in Colonial Beach, Virginia. Forwarded to pertinent governmental agencies with letter of transmittal dated September 12, 1968 as follows:

> "BE IT RESOLVED that, the Potomac River Fisheries Commission does hereby oppose the extension of the size, scope or function of any petroleum facility at Piney Point in St. Mary's County, Maryland because the Commission believes that such an extension will be detrimental to marine resources of the river and will not be compatible with the use of the river for the conservation, repletion and production of seafood,
>
> AND, the Executive Secretary is hereby instructed to send copies of this resolution to all pertinent governmental agencies."

J. Clifford Hutt
Chairman

ATTEST: Robert M. Norris, Jr.
Executive Secretary

BALTIMORE COUNTY, MARYLAND
TOWSON, MARYLAND 21204

FREDERICK L. DEWBERRY
COUNTY DEVELOPMENT COORDINATOR
VA 3-3000

October 22, 1968

OCT 25 1968

Mr. Eugene T. Jensen, Regional Director
Department of the Interior
Federal Water Pollution Control Administration
918 Elm Street
Charlottesville, Virginia 22901

Re: National Estuarine Pollution Study

Dear Mr. Jensen:

Baltimore County, Maryland has over 173 miles of frontage along Chesapeake Bay and four tributary rivers. We consider all of our waterfront to be in an estuarine zone. We have had problems along our waterfront with respect to pollution as well as conflicts among a series of different interests as to how our waterfront should be used. We recognize and accept a basic objective of preserving for public recreational use and enjoyment significant portions of our County waterfront. Nevertheless, we do not have a sufficient insight with respect to all aspects of estuarine zones to develop solid plans and programs here.

We are most interested in the National Estuarine Pollution Study. We pledge our assistance to those conducting the study in any manner that may be mutually satisfactory and Baltimore County will be represented at the meeting in Annapolis on October 30.

Sincerely yours,

FREDERICK L. DEWBERRY, Jr.
County Development Coordinator

FLD mew

Statement on: National Estuarine Pollution Study
by
Kenneth N. Weaver, Director
Maryland Geological Survey

(Francis Scott Key Auditorium, St. John's College, Annapolis, Maryland)
October 30, 1968

I would like to touch on several aspects of estuarine resources and research which are related to the geological aspects of the Chesapeake Bay region. The three areas which I will discuss are related to ground-water resources of the Bay area, mineral resources in the Bay and shore erosion problems.

The ground-water resources of the Coastal Plain of Maryland is quite large and the optimal development of this resource is probably years in the future. Nevertheless now is the time to develop the knowledge which will be vital in the management and wise use of this important resource. A great deal of information has already been developed on the subsurface geology and hydrology of the land areas of the Coastal Plain but the knowledge of the subsurface beneath the Bay has been virtually untouched. This gap in our knowledge makes it necessary to make long distance correlation of subsurface data from the Western Shore to the Eastern Shore, which in some cases is difficult and tenuous. The development of sophisticated methods of remote geophysical sensors within the past decade now make it possible to obtain information on shallow and deep subsurface geological formations beneath estuaries and oceans. Several of the sparker techniques are particularly applicable to the Chesapeake Bay. The development of this information will be vital in making the maximum use of the fresh water resources in the vicinity of the Bay and will give valuable information on the possible interactions between brackish estuarine waters and fresh water in the subsurface aquifers.

The second area which I want to touch upon is also related to the sub-bottom exploration of the Bay, in this case relative to possible mineral resources beneath the Bay and its estuaries. Sand and gravel have been removed from the Potomac estuary for a number of years. As more and more land sources of this resource are preempted by other land uses, submarine sources will become more important. We should know, at least in a general way, where these deposits are located within the Bay so that conflicting uses can be minimized by prior planning. Here again geophysical techniques can be brought to bear on this type of exploration. Our knowledge of the location, extent and thickness of old oyster bars could also be advanced by use of these exploration tools.

The third area which is of concern to us is the vastly complex problem of shore erosion and its effects upon the Bay. Although a great deal of information has already been developed concerning the rates of erosion of the Chesapeake shoreline, much remains to be measured and interpreted concerning the amount of sediment contributed to the Bay from the eroding shores. The contribution of sediment from upland sources carried to the Bay by the major tributaries relative to the proportion contributed directly from the shore is not accurately determined for the Bay as a whole. More information is also needed on the movement of sediment after it reaches the Bay, even though good data have recently been developed on this aspect in a limited area of the upper Bay. These parameters need to be more accurately defined for more intelligent use of shore protective measures and for better understanding of the effects of alteration of the bottom profile.

BALTIMORE
PLANNING
COMMISSION
DEPARTMENT
OF PLANNING

MAYOR
Honorable Thomas J. D'Alesandro III
COMMISSIONERS
David W. Barton, Jr., *Chairman*
Honorable Robert C. Embry, Jr.
Bernard L. Werner
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Charles S. Garland, Jr.
Mrs. Barr Harris
George L. Jude
DIRECTOR
Larry Reich

OCT 29 19
FWPCA

October 23, 1968

Mr. Eugene T. Jensen
Regional Director
Middle Atlantic Region
Federal Water Pollution and Control Administration
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Jensen:

Thank you for your letter of October 4, 1968, inviting me to submit my views about estuarine management problems and the factors that apply specifically to the Maryland and District of Columbia segments of the Chesapeake Bay.

I consider that the Chesapeake Bay and its tributaries is one of the primary economic assets of Maryland and that all political agencies must join forces with private agencies to do their utmost to improve and maintain it.

I strongly believe that no one political agency can do the job by itself. E[illegible] political entity should do as much as possible to eliminate further pollution, help restore the beaches and the waters for recreational uses. They should simultaneously help improve the Bay as an economic asset by dredging to accommodate deeper draft vessels. The tributaries also need dredging to allow their use by deeper draft vessels and to remove the accumulation of centuries of polluted sediment. Zoning is also required to prevent the usurption of the water front by industry and by the affluent. The political agencies should purchase sections of the shoreline that are or will be suitable for recreation including (hopefully) swimming before all the suitable sections are developed.

My principal interest naturally lies in the area of the Bay within Baltimore City. However, as aforementioned, we can do little to clean up the Bay except for reducing or eliminating the pollution

1200 American Building
Baltimore, Maryland 21202
Baltimore Street at South
Phone 752-2000, Ext. 896

being added to it by Baltimore City. We can do practically nothing towards eliminating the centuries of polluted deposits on the floor of the upper reaches of the Bay, nor can we ask for dredging the upper reaches without considering the impact on other portions of the Bay.

My personal feeling is that most will be accomplished if all political agencies work together for the common purpose of improving the Bay by whatever means possible; i.e. Federal Water Control Laws, Federal Control of waste disposal of ships, State Control of preserving the wetlands as is being done in Massachusetts, cooperative effort towards treating sewage before the effluent is dumped into the tributaries, by zoning and by contributing to research on the overall program.

Baltimore City is particularly interested in several projects:

1. The improvement of the Inner Harbor section as we have an Urban Renewal Project on its shores.

2. Filling in a portion of the Middle Branch to create more land for such large land using activities as industry, government center and marinas or other large recreational areas. This is because Baltimore is in great need of additional land for development.

3. The possibility of dredging the Back River to the Back River Sewage Treatment Plant to enable the barging of the digested sludge from that plant to sea in sea-going barges. We are also interested in trying to restore some of the Baltimore City's water front into Baltimore City's recreational areas.

I expect to send a representative of this office, Mr. Irving W. Finberg, P.E., to attend the October 30th session and to report back the discussions that occur.

Would you please put this Department on the mailing list to receive copies of speeches and final reports when it is ready.

Sincerely yours,

Larry Reich

Larry Reich
Director

cc: Dr. Boyer, Md. Port Authority
Dr. Young, RPC
Mr. Millspaugh, Inner Harbor Management

Enclosure

STATEMENT OF WALTER M. PHILLIPS TO BE PRESENTED AT THE FEBRUARY 10TH HEARING OF THE MARYLAND DEPARTMENT OF WATER RESOURCES TO BE HELD AT WILLIAM SMITH HALL, WASHINGTON COLLEGE CHESTERTOWN, MARYLAND

1967

This evening I am here as a Consultant to the Cecil County Anti-Pollution League, Inc. My name is Walter M. Phillips. I have been asked to appear before you because of my experience during the late 1950's in helping to guide the comprehensive planning of the water resources of the Delaware River Basin and to negotiate the Delaware River Basin Compact. For the past few years, I have served as a Consultant on metropolitan and regional affairs in southeastern Pennsylvania, southern New Jersey and northern Delaware. Presently, I am rendering consultant services to the Regional Plan Association of New York on the subject of waste disposal in all three forms -- gaseous, liquid and solid -- from the standpoint of long-range regional planning and how such planning can be used to protect the amenities of environment in the New York Metropolitan Region looking to the year 2000. I am also acting as coordinator of the Electric Power Industry Task Force of President Johnson's Citizens' Advisory Committee on Recreation and Natural Beauty. Here, similarly, my assignment is to help develop policies and programs for minimizing water and air pollution and for protecting the beauty of the landscape.

The purpose of my testimony is to submit to the Maryland Department of Water Resources, for its careful consideration, the proposition that its decisions in establishing water quality standards for Cecil County should be regarded as inputs to a comprehensive land-water-air use plan for the Upper Chesapeake Bay.

What this means is that the establishment of water quality standards will constitute a major determinant in what the future of the region will be. It will either encourage or deter industrial development; and if there is to be such development, it will influence the type of industrial development that will occur. So this Board must actually consider such broad questions as follow: Is the County to become an urbanized area with an economy based on whatever industries can be attracted here, including such heavy water-using industries as chemicals, petroleum refining, and possibly even basic steel? Or is the area to be preserved as a great recreation and vacationing section of the eastern United States, offering beautiful landscape, rich historic background, cultural activities, educational opportunities, open spaces, clean waters, and water contact sports? Or is the future to be shaped in the form of a compromise between these two extremes?

Is this the way the whole future of an area should be decided -- by a state water resources department acting alone on the basis of a few hearings? If not, how should the future be decided? By allowing complete freedom in the use of land, water and air? Obviously, that concept has been rejected. The County has zoning; water quality standards are about to be set; and air pollution control is on its way. So it is not an issue of planning or no planning, or of controls or no controls. It is a question of quality of planning and coordination of different types of planning, a question of comprehension, vision, and foresight. It is a matter of recognizing inter-relationships between land uses, water uses and air uses, and how each ultimately affects the whole environment. That is what constitutes comprehensive, multi-purpose planning.

How is comprehensive planning to be achieved for such a large area, and where does it start? The answer is that it can be done by the cooperation of local, state and federal agencies of government, working closely with one another and with citizen organizations. It begins with studies of all related subjects.

True, it is rather a new idea for planning studies to encompass all three of the basic elements of our environment -- land, water and air. There are many multi-purpose studies and plans for land use development and related public improvements, and there are a number of examples of so-called comprehensive, multi-purpose water resources planning. But largely because of the way government is divided up in the United States, all three of the basic elements have not been adequately brought together into a single planning process.

The Delaware River Basin Commission, which presides over what is probably the most comprehensive continuous water resources planning operation in the United States, is now discovering that land use within the basin is so integral to and so central to water use planning, that important decisions about water can not be made for want of the existence of adequate land-use development plans. It is greatly puzzled, for example, as to what quality of water standards should be established for the Delaware River Estuary. It realizes that decisions as to this can appropriately be made only by knowing what land uses are to be encouraged along the different parts of the estuary -- residential, recreational, shipping, or heavy industry. Standards should be established to serve the desired uses. If they are established without also giving due regard to what uses are planned, they may inadvertently predetermine what uses are possible. Water use controls along the estuary will probably have more to do in the future with how the waterfront land will be used than will the zoning of the communities themselves.

So it is being realized that the water and land, and the air too, must be planned together for the whole Delaware Valley. Presumably, the new Delaware Valley Regional Planning Commission and the Delaware River Basin Commission will now cooperate toward that end, the latter body having just been handed as a tool a water quality study of the estuary made under the direction of the Federal Water Pollution Control Administration, at a cost of $1.2 million.

In short, this statement is a plea for comprehensive planning of the Upper Chesapeake Bay area. It is not a plea for or against any one type of development. It is a recommendation that all of the factors affecting human life, the economy and the environment of the region be looked at together and the choices be made in the light of local, state and national interests, all this in search of the optimum benefits to be derived from the great natural resources which exist here.

It may be a new thought to many people that there is a major national interest in the Upper Chesapeake and that this national interest may also coincide with the best interests of the local communities and the state at large.

I therefore submit for your consideration a further proposition, namely, that in this particular situation there is a substantial, unique and only recently recognized national interest in the Upper Chesapeake Bay and in the closely related waters of the Chesapeake and Delaware Canal. This interest stems from the fact that the Upper Chesapeake Bay is a natural resource of enormous significance to the most populated part of our country, being located in the center of the lower half of the eastern seaboard megalopolis, extending from Boston to Washington, D.C., and containing 35 million persons.

The Cecil County portion of the Upper Chesapeake Bay alone has a practically unspoiled shore line of over 200 miles. As you know, it contains high quality water suitable for water contact sports and is extensively used for that purpose. It is an area of great natural beauty. For a new body of water with much less water surface and half the shore line, our federal government is spending almost two hundred million dollars in building a high dam and multi-purpose reservoir at Tocks Island on the main stem of the Delaware River and in acquiring about 57,000 acres of surrounding lands to be used for recreation. On the Upper Chesapeake, all this exists at practically no cost, except as to additional parklands for public access and for the will to preserve the natural qualities of the region.

Another interesting contrast is what is happening in regard to the Delaware River Estuary. As I have earlier mentioned, a water quality study costing $1.2 million has been conducted by the Federal Water Pollution Control Administration, covering the approximate 45 miles from Trenton to Liston Point, where Delaware Bay begins. To restore the quality of water throughout that distance to a level not as good as that of the Upper Chesapeake today, it is estimated would cost $460 million. No one even aspires to accomplish this goal, and testimony at public hearings has centered on whether to spend somewhere between $230 to $330 millions to bring the water to a fairly high level, or to spend only $130 to $180 million to bring the quality up to a lesser level. The federal government will pay, under present law, 30% of the cost of whatever is done.

Surely, in the light of what the federal government is spending at Tocks Island and what it will have to pay toward amelioration of conditions in the Delaware, it has a very great interest in protecting the Upper Chesapeake as a major water-based recreational area.

Another example of federal interest in our eastern seaboard waters was the preparation several years ago of a $2 million comprehensive, multi-purpose, water resources plan developed for the Delaware River Basin by the U. S. Corps of Engineers with the cooperation and assistance of 18 other federal agencies and about 45 state and local agencies. This required six years from start to finish and dovetailed with the establishment by interstate, federal compact, of a small, well-empowered commission (the Delaware River Basin Commission) lodged at a very high level in the executive branches of the federal and four state governments. To this Commission, the Corps' comprehensive, multi-purpose plan was in effect delivered for enforcement and continuous up-dating.

For the Hudson River Basin, new comprehensive studies are being launched and legislation for the creation of a commission are in the stage of negotiation. And for the Hudson a new dimension is being added, that of control of land uses along the main stem of the River. It is realized there that water resources planning must go hand-in-hand with land use planning and air use planning as well.

All of this is to say that in setting water quality standards for the Upper Chesapeake Bay area, Maryland would be well advised to seek the fullest possible cooperation of local and federal agencies and to permit no lowering of present water quality until a comprehensive land-water-air use plan can be developed and any such action found to be in accord with it.

As a former Director of Commerce for Philadelphia who initiated the idea of the City's Industrial Development Corporation, you may be sure that I am not opposed to industry as such. Rather, I want to save industry the heartaches it can bring upon itself and others from locating in an area where it will not be accepted by the American public when the latter comes to realize its enormous stake in the area. I believe that heavy industry must be supplied with suitable sites, but that this can only be done by planning at the level of large-scale regions and I advocate federal encouragement of such planning.

As you probably know, in October 1965, the Congress directed the making of a comprehensive study of the entire Chesapeake Bay and authorized $6,000,000 to be appropriated for that purpose. The first substantial appropriation for this undertaking will be forthcoming in fiscal '68 -- provided the $400,000 requested in the President's budget is granted. This undertaking can make a large contribution toward a fully comprehensive approach to the Upper Chesapeake area; and the leaders of the state and the local communities will have an opportunity to make sure that the Corps' effort is evolved into, or fitted into, a total land-water-air use planning effort which would set major goals for the region and devise plans and programs for their achievement.

TESTIMONY BEFORE A HEARING OF THE MARYLAND DEPARTMENT OF WATER RESOURCES

WILLIAM SMITH HALL, WASHINGTON COLLEGE
CHESTERTOWN, MARYLAND

2:30 P.M. - FRIDAY, FEBRUARY 10, 1967

My name is Chalmer G. Kirkbride. I am President of the Cecil County Anti-Pollution League, Inc. I am appearing as a local resident and am representing this organization today as an expert technical witness. I shall now present my qualifications as an expert technical witness.

I am a chemical engineer by profession. I was graduated from the University of Michigan with B.S.E. and M.S.E. degrees in Chemical Engineering in 1930. I received an honorary Sc.D. degree from Beaver College in 1960 and an Eng. D. degree from Drexel Institute in 1961.

I have practiced the chemical engineering profession continuously for almost 37 years. With the exception of four years, all of my chemical engineering practice has been in the chemical and petroleum industries. During the four years when I was not in the chemical and petroleum industries I served as Professor of Chemical Engineering at the A and M College of Texas. During this time I wrote the textbook, "Chemical Engineering Fundamentals" which was published by the McGraw-Hill Book Company. This text was translated into Spanish and used in a number of schools in Spain, Mexico and Latin America. The English text has been used by over 80 leading colleges and universities throughout the world.

Also while teaching at the A and M College of Texas I served as Consultant to the Secretary of War on the Bikini Atom Bomb tests in 1946.

During 1946 to 1948, inclusive and during 1950 to 1952, inclusive I served as a Director of the American Institute of Chemical Engineers, the professional organization of chemical engineers. In 1953 I served as Vice President of the Institute, in 1954 I served as President, and in 1955 I served as Past President.

I left Texas A and M in 1947 to become Vice President for Research and Development of Houdry Process & Chemical Company. I served as President and Chairman of the Board of this Company from 1952 to 1956, inclusive.

My present position is Vice President and Director of the Sun Oil Company in charge of Research & Engineering. I also serve as a Director of the Avisun Corporation, the SunOlin Chemical Company, and of the Delaware County National Bank. I served as the first President of the Avisun Corporation and have been a Director since its beginning in 1959.

For more than 10 years of my professional career, I have been responsible for putting together chemical and petroleum industrial complexes. This involves all the coexisting problems of locating plants where the desired products can be manufactured at a profit and where the sewage wastes entailed can be disposed of within the law and to the satisfaction of our neighbors. I have never and I shall never recommend locating a plant where the residents object or where the plant will not be compatible with local environment.

This concludes the presentation of my qualifications as an expert technical witness. I shall now proceed with the discussion of the subject before us.

In the past few weeks the question has been forced upon us to decide whether or not we want the Upper Bay Area to become industrialized. Specifically, the B. F. Goodrich Chemical Company has proposed to locate on the Chesapeake and Delaware Canal near Chesapeake City.

No chemical company is able to manufacture chemicals without some waste also being produced simultaneously. These wastes usually are discharged into the atmosphere, or into rivers, canals, bays, lakes, or other large bodies of water or to underground strata. Of course, all reputable companies make every effort to maintain their waste disposal within the law. To do this however the law must be set so that some waste disposal is permitted. Even under these conditions, however, it is unreasonable to expect that chemical plants can operate day in and day out under "normal" conditions. Invariably these plants encounter malfunctions because people are not infallible; neither are the instruments infallible that often automatically control these complex chemical processes. When these malfunctions occur, waste disposal often gets out-of-hand and serious concentrations are released to the atmosphere or to the canal or to whatever body of water is used for waste disposal.

During these situations, the fish and wildlife often can be found dead in very large numbers until there are no more fish and wildlife. Then the malfunctions can occur without the "tell-tale" carcasses of the fish and wildlife.

At present no wastes from chemical or any other heavy industrial plants are admitted to the Canal. Hence any departure from the status quo will be in the direction of converting this area from one of outdoor recreation and propagation of fish and wildlife to an industrial area similar to the areas along both sides of the Delaware River. The primary distinction between the Delaware River and the Chesapeake and Delaware Canal is that the Delaware River has been industrialized since the turn of the century whereas the Canal and the Upper Chesapeake Bay and tributaries have not yet been ruined for outdoor recreation, fish and wildlife by industrialization.

Most of those industries that line the bank of the Delaware River have corporate images equally as good as the B. F. Goodrich Chemical Company. They operate their plants within the law under "normal" conditions. Of course, they do have accidents which result in sharp departures from the "normal" waste disposal because these plants are operated by people who sometimes make mistakes. Also the instruments on which these people must rely for the process control of these plants sometime fail and this too may result in disastrous waste disposal.

Such accidents are unintentional and of course the managements of such plants cannot be held criminally responsible for such accidents. Even so, the river is just as polluted and the fish and wildlife are just as dead even though the accidents are unintentional.

Now another thing that must be kept in mind is that there is no simple way of treating all industrial wastes so that they do not cause pollution. I have heard it said that the wastes from the B. F. Goodrich Chemical Plant will be treated so they will be harmless. This is just so much "hogwash" and any competent industrial pollution control engineer will testify to this if he does not have an "ax to grind."

Once Goodrich is admitted to the Canal they will rely on the law which will be their savior because the law will legalize pollution of both the air and water up to specified maximums. At present there is no such pollution of the Canal from heavy industrial plants.

The purpose of this hearing is to determine how much pollution is to be permitted by law. If industrialization of this outdoor recreational area is permitted, the water qualities must be set accordingly.

Once upon a time the Delaware River was a recreational area. This is a classical example of what happens to recreational areas when they are industrialized.

Since the water qualities have not been set for the Upper Chesapeake Bay and tributaries, I cannot say specifically what the law will allow. But I can give you an example of air pollution. I am quoting from the Maryland State Department of Health Regulations Controlling Sources of Air Pollution in the State of Maryland dated December 2, 1966.

> "For installations in Maryland, plants and processes should be designed with the intent and reasonable expectation that any new source of particulate matter will contribute to the existing concentrations at ground level less than the following amounts 84 per cent of the time during any 90 day period."
>
> "In industrial areas -- 200 micrograms per cubic meter."
>
> "In commercial areas -- 150 micrograms per cubic meter."
>
> "In residential areas -- 100 micrograms per cubic meter."

To give you an idea of what 200 micrograms per cubic meter is like, the air in Northern New Jersey near New York City in its worst condition contains about 200 microgram of particulate matter per cubic meter.

Please observe that the law also permits pollution of residential areas to one-half of that for industrial areas. You see, the law does not prevent pollution. It legalizes it within maximum limits, and these maximum limits are very liberal indeed. They legalize very filthy air. I have no idea of what the State of Maryland will legalize for water pollution in the Upper Chesapeake Bay Area but if industrialization of this area is permitted, the law will have to be far more liberal in permitting pollution than if the area is kept as it is for outdoor recreation, fish and widlife. If you wish to prevent pollution of the Upper Bay Area, industrialization of this area must be prevented.

You can be certain that if Goodrich is admitted to the Canal, there will be many more chemical companies, as well as petroleum refineries and other heavy industries that will request admittance to the Canal. They will have every right to expect admittance.

Just to show you that this is no idle supposition, I refer you to Chemical Week, January 21, 1967, Pages 24-25.* The Chesapeake and Delaware Canal is referred to in Chemical Week as the "New 'Houston' Taking Shape." On the map presented in the article they already show that the Union Carbide Chemical Company has a 606 acre site selected at St. Georges, Delaware. I do not know how many other such industries are waiting in the corridors to request admittance to the Canal if the precedent is made by granting the Goodrich application, but you can bet that there are many.

Incidentally, if you would like to see what the Houston Ship Channel looks like, I refer you to Time Magazine, January 27, 1967, Page 55. You will be interested too in the following quotation made in this Time article:

> "... And out in space last September, after other astronauts had repeatedly failed to photograph Houston because of the dense brown disk of smog that usually hangs above it, Gemini II Command Pilot Pete Conrad finally shot a picture of the city on one of its better days. Discussing the photograph after his return to earth, Conrad pointed to the reduced but ever present pall over the city." "Notice the air pollution drifting out there," he said, "in case anybody thinks we don't have it."

The picture that Conrad took is on Page 55 of Time Magazine, January 27, 1967.

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*Copy Attached

Now let us consider what the B. F. Goodrich Chemical Company says they plan for the 1,000 acres where they want to build a general chemical plant adjacent to the Canal at Chesapeake City. They have indicated that the first plant will be to produce polyvinyl chloride (PVC) plastic. Now this kind of a plant is not bad --- as a matter of fact it smells like Chanel No. 5 compared with what probably will be installed later.

PVC will be produced by polymerizing vinyl chloride. They say this latter material will be shipped in from outside sources for the time being. But it is also indicated that the most obvious second plant would be to produce vinyl chloride since Goodrich has already inquired in this area about the availability of ethylene.

Now we are beginning to see what is in store for us in the next several years. The wastes from the production of vinyl chloride are highly toxic. They are chlorides of hydrocarbons but also include hydrochloric acid. A typical 200 million pound per year vinyl chloride plant would produce a waste water of the following characteristics under "normal" operating conditions.

Neutralized Waste Water	- 7,200 Lbs./Hr.
Sodium and Calcium Salts	- 5.1 Wt. %
Ethylene Dichloride (EDC)	- 0.8 Wt. %
Recovered Heavy Hydrocarbons*	- 1,900 Lbs./Hr. (4,000 Gal./D)
Dichloroethylene (DCE) + Lt. Material	- 18 Wt. %
Trichloroethylene (TCE)	- 56 Wt. %
Other Chlorinated Organics	- 26 Wt. %

* Unrecovered chlorinated hydrocarbons of course go into the atmosphere and Canal. They do not count.

These materials are generally too concentrated for conventional waste treatment and subsequent discharge to the Canal. These heavy components are therefore usually either discharged to underground disposal wells or they may be incinerated, that is, burned. And let me tell you, the fumes from this burning operation are really obnoxious. Failure of either of these latter disposal methods is always a possibility, resulting in contamination of underground water strata or release of unburned chlorinated hydrocarbons.

Even if the industrial wastes are admitted to the Canal the possibility of contamination of underground water strata and neighboring water wells is quite possible if not probable. The flow of water through the Canal is not sufficient to carry the wastes to the Chesapeake Bay or Delaware Bay within any reasonable time period. So those of you who have water wells within 5 miles of the Canal had better be prepared to drink water contaminated with chlorinated hydrocarbons.

Now what will be installed at Chesapeake City after the vinyl chloride plant? Analysis of this question leads to the conclusion that the new plant at Chesapeake City will probably be quite similar to their Calvert City, Kentucky Plant. This is suggested also by Chemical Week, January 14, 1967, Page 26.*

At Calvert City (according to Chemical Week, August 29, 1964, Pages 101-108) they produce vinyl chloride by the chlorination and oxychlorination of ethylene followed by pyrolysis of dichloroethane. The ethylene is derived by the cracking of propane which is barged up from the Gulf Coast. But anyone at all well informed on the future of propane knows that the future shortage of propane is likely to result in excessive costs at Calvert City. At that time it probably would be more economical to produce ethylene by cracking cheap foreign naphtha. This could be done very nicely on the East Coast, and Chesapeake City is the likely prospect. It could also be done at Calvert City but freight considerations favor Chesapeake City.

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*Copy Attached

Foreign naphtha could be brought into Chesapeake City and cracked to produce ethylene. Also as in the cracking of propane at Calvert City considerable propylene will also be produced. In order to make this an economical process, the propylene must be used profitably.

As in the case of Calvert City, the probability is that at Chesapeake City the propylene could logically be converted into acrylonitrile by reaction with ammonia (NH_3) and air. Now the alarming thing about this is that the synthesis of acrylonitrile by this process has proven to be one of the worst possible offenders in air and water pollution. Waste disposal procedures are still in the development stage. In other words, they have not yet worked out a satisfactory method for disposal. These wastes contain high concentrations of cyanides and believe me they are highly toxic. It doesn't take much discharge of this kind to kill fish and wildlife --- even human beings.

What the B. F. Goodrich Chemical Company really plans to do at Chesapeake City is still their secret. But once they have been given access to the Canal no one will have any control over their air and water discharges as long as they stay within the bounds of legalized pollution as set by the State. Also the same applies to all the other heavy industrial companies that certainly also will locate on the Canal.

This problem is far broader than Cecil County or the State of Maryland. Certainly Delaware, New Jersey, Virginia, and Pennsylvania are involved. The Upper Chesapeake Bay and tributaries is the last outdoor area for recreation, fish and wildlife in the Middle Atlantic States that has not been ruined by industrialization. It is presently used for this purpose and the Federal Government does not have to spend anything to maintain it for that purpose. To find other outdoor recreation areas, one has to go as far north as the Adirondack Mountains and as far south as the North Carolina Coast.

Now let us consider the proposed uses and quality standards for the waters in Cecil County. We are particularly concerned with the proposed assignment of Water Use Category VIII, "Treated Waste Assimilation and Transport," to the "Elk River and estuarine portions of creeks, coves, and tributaries." We have equal concern for the assignment of Category VIII to other Cecil County waters such as the Northeast River and Creek, and the Sassafras River, but our greatest concern is with the proposed industrial use of the waters that are tributary to the Elk River, including Back Creek and the Chesapeake and Delaware Canal.

The assignment of your Category VIII to such streams as the Elk River and its tributaries will open the door to legalized discharge of industrial wastes from companies that already covet land adjacent to the Chesapeake and Delaware Canal as new plant sites. It appears that Category VIII would not only classify those bodies of waters so designated with rather liberal water quality standards for coliform bacteria, dissolved oxygen content and pH, but would also permit discharge of industrial wastes in accordance with the State Water Resources Regulations and Rules of Procedures, 1965, Standard I, "Treatment and Disposal of Industrial Wastes," up to the following maximum levels:

Suspended Solids - Must not exceed 400 ppm.

BOD - Must not exceed 100 ppm, or the dissolved oxygen in the receiving stream must not be depleted below 50% normal saturation.

Toxic Compounds - Eliminate or reduce to limit of tolerance, substances toxic to humans, livestock, fish, aquatic life and wildlife.

Color - Must not exceed 400 ppm.

pH - Must not range below 5.5 or above 8.5.

Temperature - Must be below 100° F in the stream within 50 feet from waste outlet.

Oil - Must not exceed 30 ppm.

Taste and Odor - Effluent must not exceed Threshold Odor Number (TON) of 1000. Mixture of waste and receiving waters may not exceed TON of 80.

Detergent Wastes - ABS in detergent wastes shall not exceed 3.5 ppm before discharge.

While the above limits may be entirely adequate for streams already utilized for industrial waste assimilation and transport, they could represent a rude shock to waters unaccustomed to an industrial environment. The concentration levels specified for certain of the above parameters; such as BOD, oil content, and taste and odor, are otherwise not limited by volume, and considerable quantities (mass weight) of such discharges are presumably acceptable up to the ultimate assimilable capacity of the receiving stream, as described by the water quality criteria. We are obliged therefore to expect that industries would be otherwise unrestrained in discharging maximum acceptable quantities of whatever pollutants result from their manufacturing operations.

We take no comfort in the assignment of both Category IV, "Propagation of Fish and Wildlife," and Category VIII, "Treated Waste

Assimilation and Transport," to the certain streams such as the Elk River. Although Category VIII includes the stated objective of "maintaining safe passage for fish at all times," "fish passage" clearly requires less rigorous water quality than "fish and wildlife propagation," particularly with respect to toxicity time and concentration relationships. Would the inferior or more demanding use govern ultimate water quality levels?

In connection with the State's water use and water quality proposals, we are concerned with the public display of a map titled, "Proposed Water Uses," dated January, 1967 and prepared by the Cecil County Committee on Water Uses. This map purports to show the State's proposed water uses in Cecil County and was approved by the Cecil County Board of County Commissioners for public display in all local Post Offices for the information of local residents and property owners.

Unfortunately, the map does not accurately reproduce the State's water use proposals for Cecil County streams. Specifically, the map, as displayed, shows only State Water Use Categories I, II-B, III, and IV. The County Committee map does not show State proposals for Category VIII, "Treated Waste Assimilation and Transport," as clearly indicated in the Maryland Department of Water Resources January 4, 1967 proposals under consideration at this Hearing for the Elk River and its estuarine tributaries, the Northeast River, the Sassafras River, etc. The map contains only the cryptic note that, "Water meeting any given grade can be used for any lower grade provided such use does not downgrade the water." For the reasons enumerated above, this does not adequately describe the waste disposal uses intended, and in fact obscures this use as proposed by the State. In other words, the attention of the citizens of Cecil County has been directed to a County Commissioners' approved map which does not clearly indicate that waste disposal is to be a future use of some of the County's major streams.

Lest anyone be mislead that water quality standards alone protect our water resources, we refer to the Department of Interior May 9, 1966 Guidelines which clearly also require the designation of water uses, in Guideline 5, as follows:

> "5. Water quality standards are not designed for use primarily as an enforcement device; they are intended to provide the Secretary and State and local agencies with additional tools for objective and clear policy statements on the use and uses to which specific segments of interstate waters may be put." (emphasis ours)

Interior Policy Guideline 3 further reinforces the necessity for prescribing water uses, as follows:

> "3. Water quality criteria should be applied to the stream or other receiving water or portions thereof. The criteria should identify the water uses to be protected and establish limits on pollutants or effects of pollution necessary to provide for such uses." (emphasis ours)

That is, the citizens of Cecil County should have been fully alerted to all of the proposed water uses of their streams, including waste assimilation and transport. The publicly-displayed County Committee map did not do this.

We commend the State Department of Water Resources for recognizing under Water Use Category III, "Recreation-Water Contact Recreation," the "potential hazards involved in locating recreation areas close to sewage, industrial waste or other discharges, and will not assign this classification to waters used for swimming, when their bacterial quality is solely dependent upon adequate disinfection, and where, in the opinion of the State Department of Health, the interruption of such treatment, whether temporary or not, would render the water unsafe for such use."

The State would be well advised to recognize the converse of the above precaution. That is, no new sewage or industrial discharges should be permitted where they would represent a hazard to existing uses such as water-contact recreation, propagation of fish and wildlife, etc.

We therefore urge that the State withdraw classification of Category VIII for certain waters in Cecil County or at least modify this Category to preclude industrial waste discharges into those streams that do not now transport such effluents. We believe this is clearly required by Federal Policy Guideline 1 of the Department of Interior Federal Water Pollution Control Administration letter of May 9, 1966 to the Governors of all states, including Maryland, which states that:

> "Water quality standards should be designed to 'enhance the quality of water.' If it is impossible to provide for prompt improvement in water quality at the time initial standards are set, the standards should be designed to prevent any increase in pollution. In no case will standards providing for less than existing water quality be acceptable."

We feel that the above Federal Guideline clearly precludes discharge of any new specific waste component into a stream that is not now carrying such wastes. Stream standards must be designed to prevent such new pollution. We urge the State to modify its proposals under consideration at this Hearing and to include adequate safeguards in its forthcoming Plan for Implementation and Enforcement of those Standards prior to the Final April 18, 1967 State Hearing.

Chalmer G. Kirkbride
CHALMER G. KIRKBRIDE
13 Elk Forest
R.D. 2
Elkton, Maryland 21921

February 10, 1967

STATEMENT BY WALTER M. PHILLIPS FOR FEBRUARY 9TH HEARING OF CORPS OF ENGINEERS AT BOHEMIA MANOR HIGH SCHOOL

This evening I am here as a Consultant to the Cecil County Anti-Pollution League, Inc. My name is Walter M. Phillips. I have been asked to appear before you because of my experience during the late 1950's in helping to guide the comprehensive planning of the water resources of the Delaware River Basin and to negotiate the Delaware River Basin Compact. For the past few years, I have served as a Consultant on metropolitan and regional affairs in southeastern Pennsylvania, southern New Jersey and northern Delaware. Presently, I am rendering consultant services to the Regional Plan Association of New York on the subject of waste disposal in all three forms -- gaseous, liquid and solid -- from the standpoint of long-range regional planning and how such planning can be used to protect the amenities of environment in the New York Metropolitan Region looking to the year 2000. I am also acting as coordinator of the Electric Power Industry Task Force of President Johnson's Citizens' Advisory Committee on Recreation and Natural Beauty. Here, similarly, my assignment is to help develop policies and programs for minimizing water and air pollution and for protecting the beauty of the landscape.

In the notice of tonight's public hearing, it is stated that opportunity will be given for witnesses on the suitability of the proposed B. F. Goodrich petrochemical plant site to offer "information on other pertinent factors, including fish and wildlife conservation aspects ..." For this I wish to compliment the Corps of Engineers, as in this day of complex inter-relationships and interdependencies of functions in our society, we can afford to proceed with one type of land use, only in light of comprehensive multi-purpose planning for all related uses, and in a case such as this, for the entire geographical region likely to be affected. The Corps apparently fully recognizes that in this situation it faces not only responsibility for questions relating to navigation, but also for environmental considerations such as water and air pollution, which, of course, have a great bearing on fish and wildlife as well as on the amenities of human life in the area. It appears to me that you indicate basic concurrence with the thinking of those local residents who have asked me to speak to you tonight about the reasons for a fully comprehensive planning review before any decision is made on the action requested of the Corps of Engineers.

I am confident that it can properly be assumed that the Corps has responsibility for protecting all aspects of the national interest in any use it may allow, through lease or otherwise, of government-owned property. I derive this from the premise that the first duty of the Corps of Engineers, U. S. Army, is to the United States of America. At the same time, I would like to note that such duty in itself encompasses a high degree of concern for local interests, but never at the expense of an over-riding national interest.

Therefore, the all-important question which must be asked at the outset is: "What national interest, if any, must be satisfied before a lease such as that requested here can properly be granted?"

I submit, Sir, that in this particular situation there is a unique and only recently recognized national interest in the Upper

Chesapeake Bay and in the closely related waters of the Chesapeake and Delaware Canal. This interest stems from the fact that the Upper Chesapeake Bay is a natural resource of enormous significance to the most populated part of our country. A heavy duty therefore rests upon the Corps of Engineers as the agency to act for the United States Government in this situation. In the performance of that duty it is essential that the Corps consult fully with each of the other agencies of the U. S. Government which has a responsibility for a water or other resource function of the federal government and which would be directly, now or later, affected by the granting of the requests under discussion tonight.

I am aware that in October 1965, the Congress directed the making of a comprehensive study of the entire Chesapeake Bay and authorized $6,000,000 to be appropriated for that purpose. I am also aware that the first substantial appropriation for this undertaking will be forthcoming in fiscal '68 -- provided the $400,000 requested in the President's budget is granted. Therefore, this study can not offer immediate answers relating to the questions before you tonight.

It is natural, nevertheless, for the people for whom I now speak to ask whether the Corps of Engineers has requested, for the record and as a basis for the decision it will need to make on the proposed Goodrich lease, a formal opinion of the following agencies as to possible bearings on the subject matters for which they are responsible:

Federal Water Pollution Control Administration
(for water pollution)

United States Public Health Service
(for air pollution)

Fish and Wildlife Service

U. S. Geological Survey
(for effects on ground water)

U. S. Weather Bureau
(for dispersion of air pollution)

Bureau of Outdoor Recreation
(for effects on use of nearby waters and land for recreation)

U. S. Park Service
(for effects on existing or potential park areas)

U. S. Department of Agriculture
(for effects on farming from air pollution from the proposed initial plant or from pollution caused by future development of this heavy chemical industry)

Housing and Urban Development Department
(for opinion on the effects on residential development).

Even clearance with these agencies, acting alone, can not meet the demand for vision and understanding with which the Corps of Engineers is confronted in this situation. There is a higher trust resting upon you and your agency, Sir, for which this and future generations will hold us all accountable. This is the trust of protecting the national heritage. The greatness of our natural heritage in the Upper Chesapeake Bay has received practically no public attention. You are the first responsible officer of our national government, so far as I know, to be placed in the difficult position of having to make a decision for the United States which will set a precedent that will be the determining factor in whether or not the Chesapeake and Delaware Canal area shall gradually become a center for petrochemicals and other heavy water-based industries, using as their own for docking and for the disposal of liquid wastes the channel you have dug, improved at great expense, and maintained, all by the application of general taxpayers' funds, for the facilitation of coastal shipping. Your decision in this matter will set the stage for industrialization that will materially change the very closely related Upper Chesapeake Bay, or it will set the stage for the preservation of the greatest body of fresh water on the eastern seaboard, enabling it forever to be used for recreation, preserved for open space and natural beauty, and protected as one of our nation's great natural resources -- one of our greatest because of its location so close to so many millions of people -- a location in the center of the lower half of the eastern seaboard megalopolis of 35 million persons.

The Cecil County portion of the Upper Chesapeake Bay alone has a practically unspoiled shore line of over 200 miles. It contains high quality water suitable for water contact sports and is extensively used for that purpose. It is an area of great natural beauty. As you know so well, for a new body of water with much less water surface and half the shore line, our federal government is spending almost two hundred million dollars in building a high dam at Tocks Island on the main stem of the Delaware River and in acquiring the land to be flooded and the surrounding lands to be used for recreation. On the Upper Chesapeake, all this exists at practically no cost, except as to additional parklands for public access and for the will to preserve the natural qualities of the region.

At the same time that the Corps of Engineers is faced here with the question of allowing a breakthrough for industry which can only lead in the end to a Houston Ship Channel type of general land-water-air use which will probably sprawl down the Upper Chesapeake Bay the way such industrial land use has sprawled along the Delaware, the Delaware River Basin Commission has been holding hearings on the question of water pollution abatement on the Delaware Estuary. The proposal for restoring that entire body of water to a quality satisfactory for water contact sports, a quality still inferior to that which the Upper Chesapeake apparently already has, carries a price tag of $460 million.

In the past decade, one of the big steps forward in environmental planning was the preparation of a $2 million comprehensive, multi-purpose, water resources plan developed for the Delaware River Basin by the U. S. Corps of Engineers with the cooperation and assistance of 18 other federal agencies and about 45 state and local agencies. This required six years from start to finish and dovetailed with the establishment by interstate, federal compact of a small, well-empowered commission lodged at a very high level in the executive branches of the federal and four state governments. To this Commission, the Corps' comprehensive, multi-purpose plan was in effect delivered for enforcement and continuous up-dating.

For the Hudson River Basin, new comprehensive studies are being launched and legislation for the creation of a commission are in the state of negotiation. And for the Hudson a new dimension is being added, that of control of land uses along the main stem of the River. It is realized now that water resources planning must go hand-in-hand with land use planning and air use planning as well. To set standards of water quality is meaningful only in relation to land uses which require such water quality; and vice versa, where water uses are the predominant consideration, whether for recreational purposes or catch basin purposes to meet municipal water supply demands, land uses must be harmonized with such water use purposes.

As a former Director of Commerce for Philadelphia who initiated the idea of the City's Industrial Development Corporation, you may be sure that I am not opposed to industry as such. Rather, I want to save industry the heartaches it can bring upon itself and others from locating in an area where it will not be accepted by the American public when the latter comes to realize its enormous stake in the area. I believe that heavy industry must be supplied with suitable sites, but that this can only be done by planning at the level of large-scale regions and I advocate federal encouragement of such planning.

On behalf of the thoughtful conservationists of the Upper Chesapeake Bay, I wish in closing to submit to the Corps of Engineers the proposition that the case being heard tonight can not properly be decided in isolation. I suggest that action on the lease be deferred until a comprehensive, multi-purpose, water-air-and related land resources approach can be made to the policy questions involved.

I believe that at this juncture this is the only way the Corps of Engineers, U. S. Army, can act in the national interest in regard to the Chesapeake and Delaware Canal and the Upper Chesapeake Bay.

NAPOP-N

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE-2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

10 January 1967

NOTICE OF PUBLIC HEARING

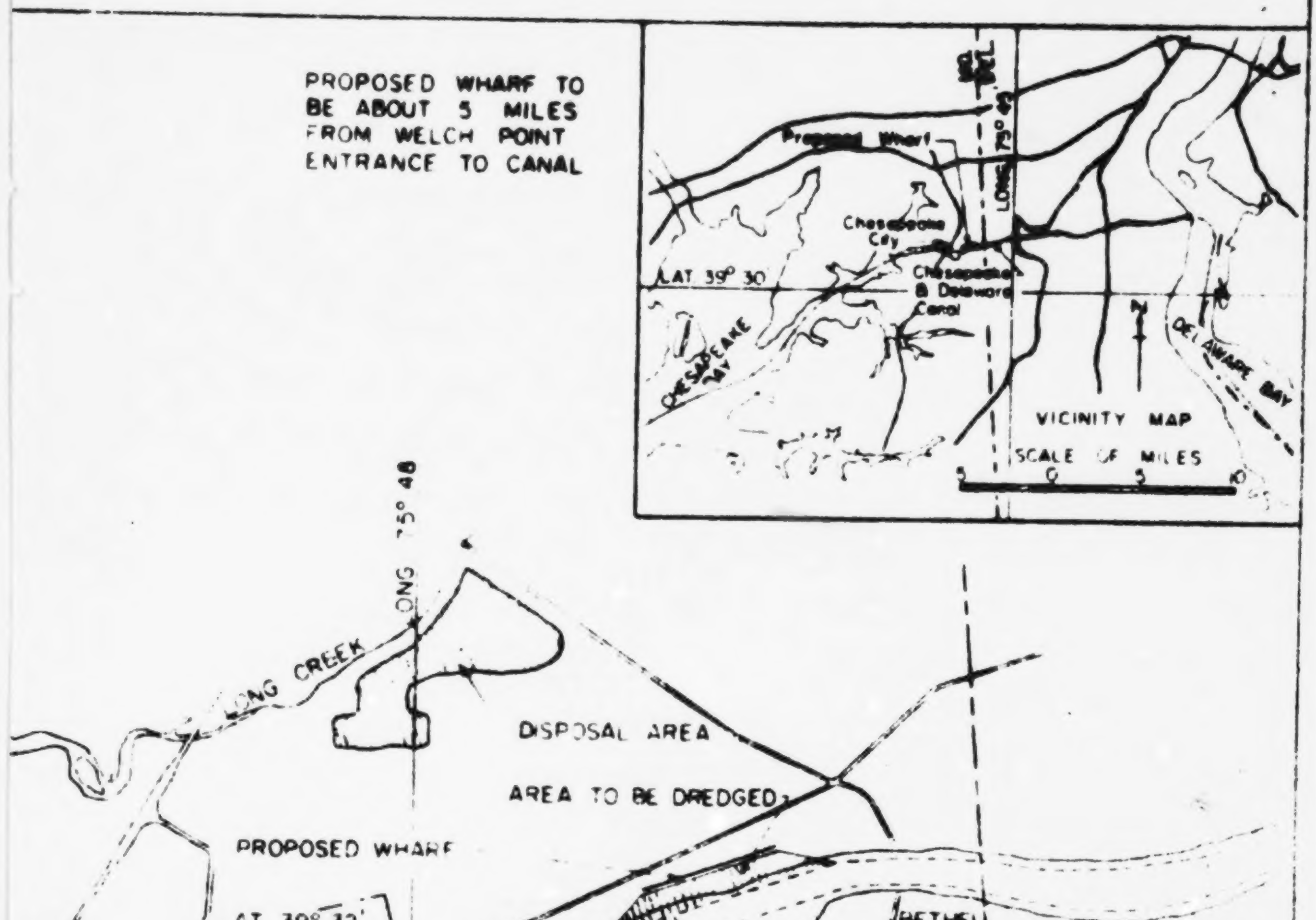
The application of the B. F. Goodrich Company for a Department of the Army permit to construct berthing facilities and to dredge in and along the Chesapeake and Delaware Canal, on the northerly side of the canal, 1.5 miles easterly from the high-level bridge at Chesapeake City, Maryland, will be considered at a public hearing on the subject, to be held by the undersigned in the auditorium of the Bohemia Manor High School, near Chesapeake City, at 7:30 P.M., Thursday, 9 February 1967.

All interested parties are invited to be present or to be represented at the above time and place, particularly the officials of any State, county, city, town, or local association whose interests may be affected by the proposed work. They will be given an opportunity to express their views upon the suitability of the location and the adequacy of the plans in reference to navigation and to suggest any changes considered desirable. Information on other pertinent factors, including fish and wildlife conservation aspects, will be accepted and made part of the record and will be considered in determining whether it would be in the best public interest to grant a permit.

Oral statements will be heard, but for accuracy of record all important facts and arguments should be submitted in writing as the records of the hearing will be forwarded for consideration by the Department of the Army. Communications received in this office prior to the hearing will be placed in the record at the hearing. Further written statements may be handed to the undersigned at the hearing for inclusion in the record.

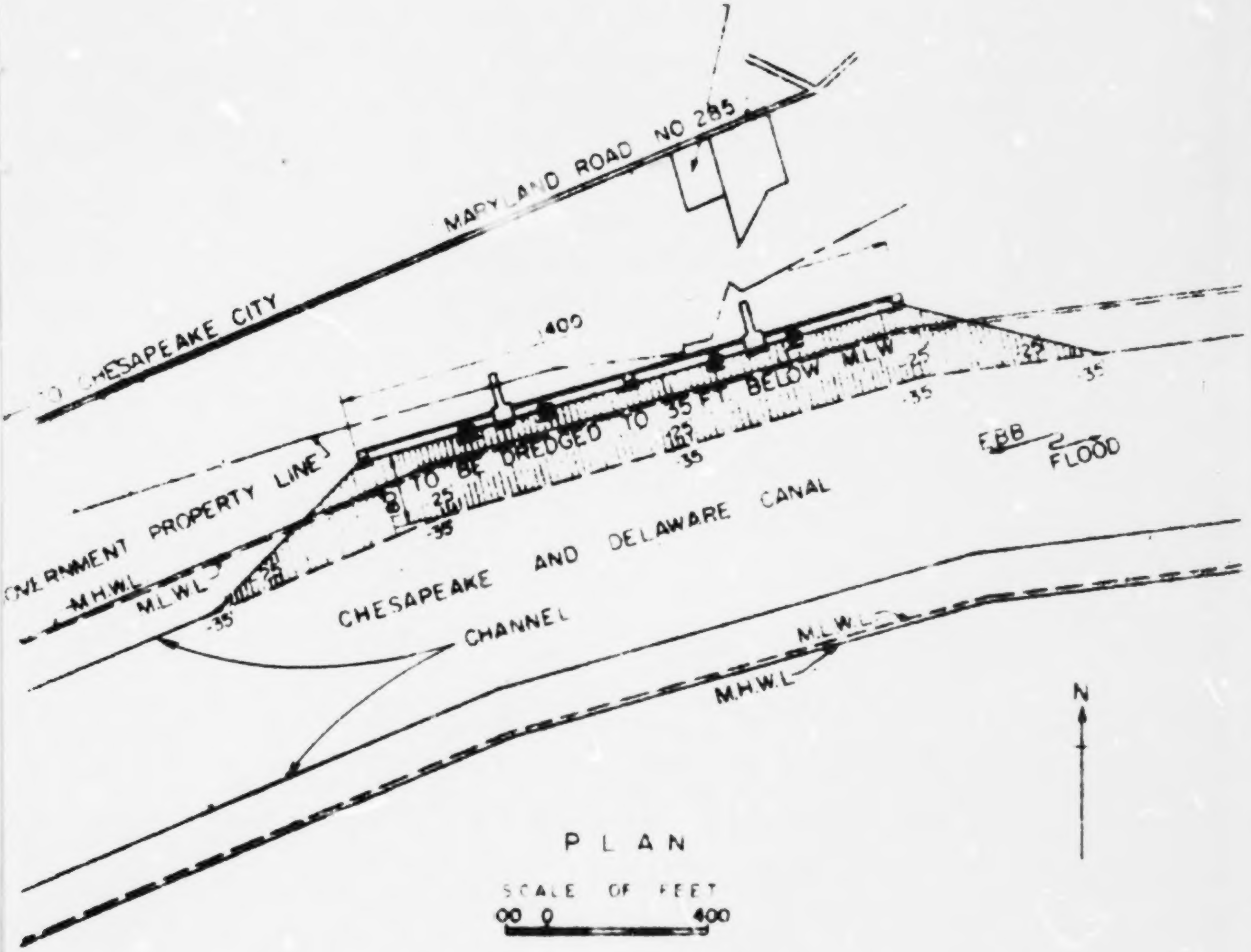
The applicant's plans provide for constructing a wharf 1400 feet long, with appurtenant mooring dolphins, the structures to be located shoreward from the general alignment of the canal bank, no closer than 180 feet to the ship channel. The area in front of the proposed structures would be dredged to a depth of 35 feet at mean low water, the dredged material to be placed on the applicant's property north of the canal. The location of the proposed work, including the disposal area, is shown on the reverse side of this sheet. Plans of the work are shown on both sides of the attached sheet.

WWWatkin
W. W. WATKIN, JR.
Colonel, Corps of Engineers
District Engineer


PROPOSED WHARF TO BE ABOUT 5 MILES FROM WELCH POINT ENTRANCE TO CANAL
Proposed Wharf
MD. DEL.
LONG 75° 45'
Chesapeake City
LAT 39° 30'
Chesapeake & Delaware Canal
CHESAPEAKE BAY
DELAWARE BAY
N
VICINITY MAP
SCALE OF MILES
5 0 5 10
LONG 75° 48'
LONG CREEK
DISPOSAL AREA
AREA TO BE DREDGED
PROPOSED WHARF
LAT. 39° 32'
BRIDGE
CHESAPEAKE CITY
CHESAPEAKE & DELAWARE CANAL
BETHEL
CITY LINE
MARYLAND
DELAWARE
N
SCALE OF FEET
0 1000 2000 3000

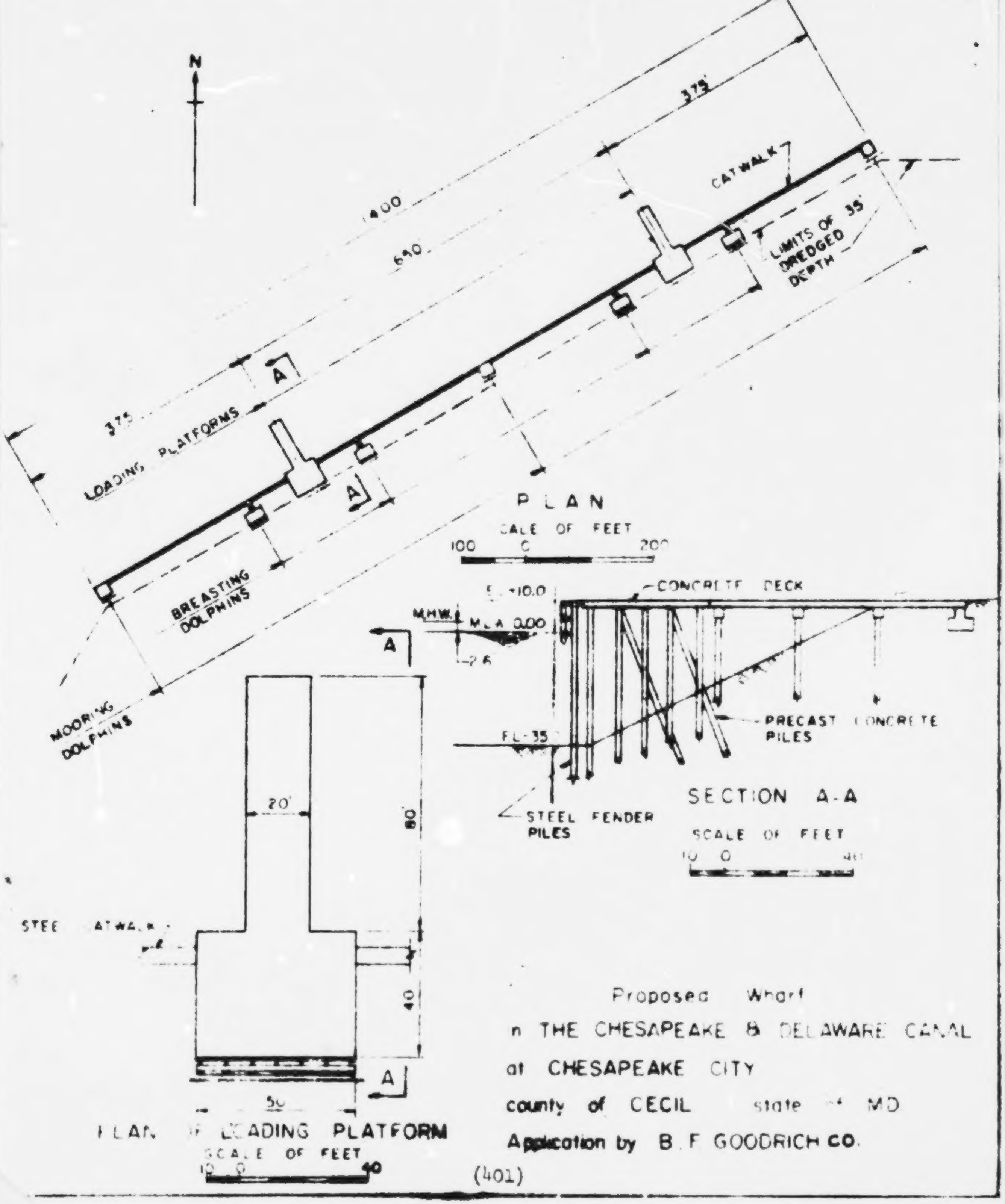
LOCATION MAP
From U.S.C. & G.S. Chart No. 570

Proposed wharf
in THE CHESAPEAKE & DELAWARE CANAL
at CHESAPEAKE CITY
county of CECIL state of MD
Application by B. F. GOODRICH CO.


TO CHESAPEAKE CITY
MARYLAND ROAD NO 285
400
TO BE DREDGED TO 35 FT. BELOW M.L.W.
25
-35
10
OVERNMENT PROPERTY LINE
M.H.W.L
M.L.W.L
CHESAPEAKE AND DELAWARE CANAL
CHANNEL
EBB
FLOOD
M.L.W.L
M.H.W.L
N
PLAN
SCALE OF FEET
00 0 400

Soundings are in feet
and refer to mean
low water

Proposed Wharf
in THE CHESAPEAKE & DELAWARE CANAL
at CHESAPEAKE CITY
county of CECIL state of MD
Application by B.F. GOODRICH CO


N
1400
690
375'
375
CATWALK
LIMITS OF 35' DREDGED DEPTH
A
LOADING PLATFORMS
BREASTING DOLPHINS
MOORING DOLPHINS
PLAN
SCALE OF FEET
100
0
200
EL +10.0
CONCRETE DECK
M.H.W.
M.L.W. 0.00
-2.6
EL -35
PRECAST CONCRETE PILES
STEEL FENDER PILES
SECTION A-A
SCALE OF FEET
10
0
40
20'
80'
40'
50'
STEEL CATWALK
PLAN OF LOADING PLATFORM
SCALE OF FEET
10
0
40

Proposed Wharf
in THE CHESAPEAKE & DELAWARE CANAL
at CHESAPEAKE CITY
county of CECIL state of MD
Application by B. F GOODRICH CO.

]

Supplemental Statement of William W. Jeanes
in connection with Meeting on the Chesapeake Bay
estuarine system held at Annapolis, Maryland on
Wednesday, October 30, 1968

My family for many generations have lived on the Elk River in Cecil County and while I live and work 60 miles away in the Philadelphia area, I continue to own a farm on the north shore of Cabin John Creek fronting on the Elk River in Cecil County. My farm which I have owned for over thirty years is across a mile and a half of water from the Elk River State Park. The river has been dredged to 35 feet to accommodate big ships as part to the Chesapeake and Delaware Canal development. Thus I have watched for more than a generation the impact of our developing civilization on this lovely area.

The Upper Chesapeake is a treasured part of the Bay deserving the utmost protection. It is the one part of the bay free of sea nettles and suitable all summer long for bathing. At the juncture of the Piedmont and the Coastal Plain its variety of wooded hills, bluffs, marshes and farm land, its water, its fish, its wildlife, its beauty are superb assets not only to the inhabitants nearby but also to the thousands of people who are attracted to the area. There is no other large readily accessible unspoiled essentially fresh water area along the Middle Atlantic Coast. The Delaware River is so completely contaminated that a $500,000,000 program is being projected by the Delaware River Basin Commission to clean it to a lesser water quality standard than that existing in the Upper Chesapeake today.

In recognition of the need for additional recreational area in this Middle Atlantic region, the Delaware River Basin Commission with the help of the U. S. Army Engineers is developing a huge lake just north of the Delaware Water Gap at Tocks Island. This project involves a multi-purpose dam designed to be useful for power, flood control, water supply and navigation. The pool behind the dam will create a shoreline 100 miles in length. The resulting Delaware Water Gap National Recreation Area will be administered by the National Park Service. A 10,000 acre lake and a 60,000 acre park will result. The total cost will exceed $150,000,000 and the development isn't scheduled to be complete until 1975 - work is far behind schedule and serious difficulties are causing further delays.

The Upper Chesapeake in many ways is a God-made Tocks Island project surpassing it in size and by its natural beauty. It serves the needs for living, relaxation, recreation and inspiration to many people of the entire surrounding area; not only people of Cecil, Kent, Harford and Baltimore counties but also from Metropolitan Philadelphia, Chester, Wilmington, Newark, Lancaster, York and far beyond.

The shoreline of the upper bay is almost completely dominated by waterfront houses and cottages, farms, woodlands, marinas, bathing beaches, camps, the 1,600 acre Elk Neck State Park and the 72,000 acre Aberdeen Proving Grounds. The Federal government probably owns one third of the total shoreline of the upper bay. (Note also the Perry Point Veterans Hospital land and the land owned by the U. S. Army Engineers in connection with their operation of the Chesapeake and Delaware Canal.)

Elk Neck State Park has been enlarged from the original 345 acre tract devised in 1936 to the State of Maryland by Dr. William L. Abbott of Philadelphia to its present size of almost 1,600 acres. Visitors to the park have increased from [illegible] in 1953 to [illegible] in [illegible]. I understand it to be the most popular park in Maryland. Its miles of shoreline on both the Elk and Susquehanna Flats (Northeast River) provide the basis for water oriented activity.

The U. S. Army Engineers at Welch Point on the Elk River is providing as part of the canal development an additional Cecil County Park site for bathing and water recreation. This site is to be operated by the State of Maryland.

The Cecil County Zoning maps show that an overwhelming percentage of the estuarine water frontage of the County has been zoned for farming, recreational, residential and woodland use.

I would like to mention the damage to the Upper Chesapeake caused by the Chesapeake and Delaware Canal. One serious aspect of the canal is the fact that too much fresh water coming down the Susquehanna finds its way through the canal to the Delaware Bay. Prior to the construction of the canal, the Upper Chesapeake usually remained fresh and suitable for all uses even in late summer.

There was a noticeable change when the canal was deepened to 28 feet, then only during very dry weather did the Upper Chesapeake turn brackish. In the last few years because of continuous drought and the widening and deepening of the canal the water becomes quite salty during the summer months. The effect of this on the ecology of the bay must be very pronounced. One may wonder if the decline of fishing and oystering in the bay may inpart be due to the lack of fresh water going down the bay to purge it and reduce salinity.

Another serious concern involves turbidity which I observe particularly in the Elk River. Elk River water, prior to the canal, used to be clear except during storms. With advent of the 28 foot and 35 foot channel the water remains turbid, clearing only when a dock strike or an accident in the canal stops heavy shipping. Ships travelling at high speed often cause waves which hit the shore with a sound resembling that of a pistol shot. It takes a long while for the mud to settle and before it does another ship comes and keeps the bottom stirred up. Damage to underwater plant life, fish breeding areas and to the shore is great. Only by much stricter regulation of the speed of ships can this turbidy be reduced.

Finally, those of us on the Elk River hope that the proposed 5400 foot anchorage on the west side of the canal channel in the Elk will never be needed. This anchorage, proposed by the Army Engineers to be directly in front of the State Park would prove a serious blow for the Park and those of us nearby. As ships weigh anchor and get underway, an immense amount of mud and clay is drawn up on their anchors and whipped off the bottom by the wash of their propellers, especially when it is necessary to change the ship's direction reentering the channel. This mud stays in suspension a long while making water conditions for bathing distasteful and causing siltation close to shore.

The Upper Chesapeake must be recognised as a great National asset and I welcome all efforts made to preserve its unique value.

Thank you.

William W. Jeanes

William W. Jeanes

RUMMEL · KLEPPER & KAHL *consulting engineers*

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CHARLES G. CLARKE
H. LEROY WHITELEY, JR.
ERIC K. WEBER

November 6, 1968

Mr. Eugene T. Jensen
Regional Director
Middle Atlantic Region
Federal Water Pollution Control Administration
918 Emmet Street
Charlottesville, Virginia 22901

Reference: Chesapeake Bay & Estuaries
October 30, 1968 Hearing
Annapolis, Maryland

Dear Mr. Jensen:

It was rather late in the day when I made my statement on behalf of Charles Center-Inner Harbor Management, Inc. as you may recall, and in spite of the interest generated by a number of good papers and statements, I am sure we were all ready to adjourn.

I had prepared some independent remarks during the day, and since you indicated that the records of this meeting would remain open approximately thirty days, I have decided to submit these comments - not as a consultant representative of Charles Center-Inner Harbor Management, Inc., and perhaps not entirely as a consulting engineer, but rather as a citizen who can see the handwriting on the wall. I trust you will find these comments not too far afield from the avowed intent of the hearing.

Very truly yours,

Ralph E.

Ralph E. Marquiss, P.E.

REM:ww
Encl.
cc: Mr. Paul W. McKee
Mr. Norman E. Jackson

to realize, as an example, the incongruity of paying, without a second though, $120 per year for our daily package of cigarettes, while rising in righteous indignation against projected annual sewerage charges of $90 to $100 - an average figure in rural areas.

to become aware of the fact that construction costs are rising, that the present bond market is tenuous at best, and that unnecessary delays in the implementation of sewerage planning can send its eventual cost in only one direction - up.

And finally, to look upon state regulatory agencies and their officials not as arbitrary, unreasonable, and capricious, (some of the more complimentary terms I have heard applied over the years) but as what they really are - dedicated public servents, certainly understaffed (money again) but working for the common good.

COMMENTS ON OCT. 30, 1968
HEARING ON CHESAPEAKE BAY & ESTUARIES

This meeting has been geared to the expression of desired goals, and techniques of problem definition, and this is as it should be. In the final analysis, however, the problem will be reduced to its lowest common denominator - money.

John Gardner emphasized this premise in a recent speech, when he said - and I paraphrase - if any of you have found a way to solve these problems without spending money - a lot of money - let me in on your secret.

It has already been reported to us that more sophisticated waste treatment will increasingly be required both for nutrient removal and treatment of increasing volumes and strengths of waste - and this costs money.

Since such complex treatment plants are only as effective as their skillful operation and maintenance, it is obviously impracticable to dot these facilities over the landscape to serve individual small communities - regional sewerage systems and consolidation of treatment facilities are the answer - and these cost money - even when constructed in judicious stages.

In the more rural counties and regions, the absence of sewerage facilities, or the common practice of subsidizing an inadequate sewerage charge with the ad valorem tax or other unassigned revenue source has given rise to the belief by many people that the real cost of sewerage service is - and should continue to be - negligible, or at best, nominal.

The many federal and state grant programs related to sewerage construction are godsends, and essential to the economic feasibility of most smaller projects. They have, however, continued to foster the myth of low local cost.

One task, then, that faces all of us concurrent with technological planning, is education of the general public:

to recognize, in the case of industry, the concept of pollution abatement as an integral cost of doing business.

to recongize sewerage service and pollution abatement as the enormous and essential benefit it really is, and to realize that such a benefit cannot be intrisically free.

News: From: **SENATOR JOSEPH D. TYDINGS**

6237 New Senate Office Building
Washington, D.C. 20510
202-225-4524

Statement of

Senator Joseph D. Tydings of Maryland

Submitted for the Hearings of

The National Estuarine Pollution Study

Office of Estuarine Studies

US Department of Interior

In April 1966, I introduced in the Senate S 3240, directing the Department of Interior to conduct a three year, $3 Million, comprehensive study of pollution in our tidal estuaries and their adjacent land areas. This bill was enacted as Section 5G, Title II of the Clean Water Restoration Act of 1966.

Section 5G resulted in the establishment of the Office of Estuarine Studies within the Department and provided the legislative authority for the present National Estuarine Pollution Study.

It is this study which has brought together experts on estuaries from throughout the nation to discuss the preservation of these important natural resources. During the last few months the O.E.S. has held a series of public hearings on the Atlantic, Gulf, and Pacific coasts to bring together and expand present knowledge of our estuaries. I am pleased to submit this statement in connection with the hearings held October 30, 1968, at St. John's College in Annapolis on the shore of what is probably the greatest estuary in the entire United States - the Chesapeake Bay.

For the benefit of the general reader, I should define "estuary". It may best be thought of as an "edge," irregular and difficult to delineate precisely, where the fresh water

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of streams and rivers joins and dilutes the tidal salt water of the sea. The word itself comes from the Latin *aestuarium* which means "tidal".

The coastline of the United States is over 90,000 miles long. Almost all of it can be considered adjacent to estuarine waters. There is hardly a mile of coast not broken by the flow of fresh water into the sea.

Our estuaries are of the greatest importance. They are thought by many scientists to be the cradle of life. They are a vital part of a complex life zone that includes the vast area of the continental shelf. Most marine life is dependent upon this edge of the sea and its waters. Here is where one finds mussels and clams, shrimp and lobsters, crabs and sea ducks. Here is where one catches most of the fish found within the waters of our country. The Bureau of Commercial Fisheries reports that at least 7 of the 10 most valuable species of commercial fish spend important parts of their life cycle in estuarine waters. Moreover, three fourths of the most frequently caught sport fish along the Atlantic coast are dependent upon estuarine waters. These sport fish include such well-known angling prizes as flounder, bluefish, and striped bass.

I should add, moreover, that estuarine waters comprise the last great hope for feeding a hungry world with its exploding population. Most of the fish to be used in the newly developed fish protein concentrate process will come from the estuarine zones of our Nation.

Estuaries really have but two common characteristics. The first is change. The other is the great void of knowledge concerning their behavior. Estuaries are always in motion - battered by storms, shifted by tides and floods, and invaded by successions of plants and animals. The gradations from fresh to salt water, characteristic of all estuarine zones, may be almost imperceptible and the line of demarcation varies from season to season, week to week, and sometimes even hour to hour. We know little of the tidal hydraulics of estuaries - what causes the saline level to vary and what effects this variance has upon the many forms of life within the waters.

Many estuarine zones, of course, have large numbers of people within their boundaries. Twenty-five percent of the American population lives within 50 miles of the coast and it is projected that within 30 years the population along the coast will double. The greatest megalopolis in the world today, extending from Boston southward to Washington D.C. borders an estuarine zone.

As Americans become more and more prosperous, they will have more and more time for recreation. As this Nation enters into what might be termed an age of affluence and leisure, our estuarine zones will become even more valuable than they are today. Sailing, swimming, hunting, fishing, hiking are all increasingly popular activities taking place in the estuarine zones.

Thus, estuarine zones are indeed of paramount importance to the American people. But, I am sad to say that we have not taken care of this precious resource of ours. In typical but not inevitable fashion, man has abused a part of nature which has served him well and which is vital to his existance. With little effort to protect estuarine values while still providing necessary service and facilities, many acres of our estuarine zones are slowly being ruined. With bulldozer and dredge, pump and power shovel, man haphazardly has destroyed many estuarine areas.

National totals of lost acreages on estuarine waters have never been compiled, but there is little doubt that these areas

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comprise some of America's most rapidly disappearing gifts of nature. Ditches for mosquito control and for production of salt marsh hay along the Atlantic coast from Maine to Virginia have worked great ecological change on 90 percent of this region's total original acreage of tidewater marshlands.

In 1959, a survey of Long Island wetlands by the New York State Conservation Department and the U.S. Fish and Wildlife Service revealed that 12.5 percent of high and moderate value wetland habitat areas had been destroyed since 1954. The survey also showed that 30 percent of the remaining wetlands were in danger of destruction within 5 years and likely to be lost within the foreseeable future.

The ways in which man thoughtlessly destroys these areas are many. It is usually more convenient and less expensive to pump industrial and domestic waste directly into an adjacent body of water than to dispose of it in some other way. Factories erected on or near our shores, cities built at the mouths of our great rivers, and countless thousands of resort hotels, motels, summer homes - priced for a "view of the Bay" - all these find coastal marshes and tidewater flats to be convenient places to get rid of garbage, industrial wastes, litter, and the rest of civilization's debris.

In other places, estuaries are either being drained or filled in so that additional factories, homes, marinas, causeways, and bridges disrupt the normal circulatory regime and create stagnant pools which are no longer true estuaries.

Finally there is an unseen destruction. This is the silent killing of estuaries and their associated fish, plants, and animals by pollution. Marine life lives precariously close to the doorstep of doom. A slight change in the environment often spells disaster. Most Americans are not aware of the great tragedy now taking place in the Chesapeake Bay where the great decline in oyster production is due in part to unnecessary water pollution. Most susceptible of all, however, are the young fish, crustaceans, arthropods, and microscopic forms of life which bound in estuarine waters. In short, we have polluted the waters and destroyed much of the wetland areas of our estuarine zones. Such spoilage must stop.

But before we act to stop it, we must know something about these zones. Action based on insufficient knowledge is usually action later regretted. If we continue to change the characteristics of our estuarine zones before we know much about them and the consequences of our actions - as we are now already doing - we are more than likely to act unwisely.

It is, therefore, imperative that our knowledge of estuarine zones be increased. What little we do now possess is fragmented, having resulted from no consistent study. A broad and systematic study of the entire system of estuarine zones in the country is needed so that the estuarine environment we leave our children is a healthy, ordered, and attractive one.

The OES' study now underway can increase our knowledge in several important ways.

FIRST - It will document and analyze estuarine pollution. The OES notes that the technical aspects of pollution and water quality control in estuarine areas are infinitely more complicated than in fresh water rivers and lakes. The infinite variations in the combination of fresh and salt waters, with variable densities and responses to river flows and tidal conditions, greatly complicate estuarine pollution abatement and surveillance. A body of technical information oriented specifically to the estuarine environment is required.

SECOND - It will explore governmental responsibility in the estuarine zones, defining the roles of the federal, state and local governments, as well as that of the private sector. This. I believe, is most important. The overlapping and compartmenta-

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lization of responsibility for the Chesapeake Bay has weakened our overall effort to maintain and enhance the water quality of this great estuary. State agencies, regional agencies, the federal government, and private organizations all have a legitimate concern with the Bay. But certainly it is fair to ask whether or not the price of this concern is lack of coordination. With so many agencies operating at different levels, the inevitable result has been a definite disorder in planning. No one is responsible for the total picture. Each agency has its own overview. What is needed is a program of meaningful coordination among the various local, state and federal agencies and the development of an overall design for the Chesapeake Bay, a design that would take into consideration the different interests involved in the proper management and development.

THIRD - It will make recommendations for a comprehensive national program for the preservation, study use, and development of our estuarine areas. A study is a fine thing and knowledge for knowledge sake is not to be scoffed at. But our estuaries, particularly the Chesapeake Bay, simply are too important for more study. We must act and act soon. The legislation for the National Estuary Pollution Study was drafted so that recommendations for action will be made by the Office of Estuarine Studies.

Let me state here and now that I intend to follow up these recommendations, where applicable, in the Senate.

I believe that the National Estuary Pollution Study can make a significant contribution to the sensible and farsighted development of a vital natural resource. Our estuaries, as we belatedly have come to realize, are too important to abuse either by neglect or ignorance.

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I applaud the Department of the Interior for the speed and skill with which the study is being conducted and express my appreciation to those individuals who have shared their expertise at the many public hearings held throughout the nation.

As the sponsor of the original legislation, as a Senator from the state containing one of the great estuaries and as an individual concerned with the quality of our natural environment, I stand ready to assist the effort to develop our estuaries properly in any way that I can.

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ESTUARINE MANAGEMENT

COAST GUARD POLICY

The Coast Guard's position with respect to estuarine management is that of cooperating with the FWPCA and counterpart agencies at the state and lesser level in the studies on the subject being conducted by these organizations. This cooperation involves:

a. The utilization of Coast Guard forces, personnel and facilities, as operations permit, in the acquisition of data desired by these agencies.

b. Providing information relative to navigation, water pollution and recreation: current problems and potential developments, and the proposed Coast Guard programs to meet present and future needs in each of these areas.

c. Coast Guard representation on the Committee on Multiple Use of the Coastal Zone of the National Council on Marine Resources and Engineering Development, and similarly on regional commissions/study groups considering the management of coastal and estuarine zones.

The Coast Guard policy in its many missions, from which many valued inputs will be made to this study, may be summarized as follows:

a. The Coast Guard's primary responsibility in water pollution is to enforce the related federal statutes. The policy is to work closely with other interested agencies, primarily the FWPCA of the Department of Interior, and the Corps of Engineers of the Department of the Army in the development of programs for control and abatement of pollution of the waterways by oil and other hazardous materials. One such coordinated effect is the National Inter Agency Contingency Plan for use in the event of a major oil spill.

This provides for the Coast Guard to assume the on-scene and coordinating control of necessarily large scale operations to combat large spills. On the regional level, there is also close coordination and planning with the Maryland Port Authority in developing ready capability to meet these types of disasters.

b. The Coast Guard's responsibility in navigation is to provide aids to navigation as needed and justified to meet the needs of the users of the waterways. The policy is to meet the improvements and alterations in size or character of the waterways by effecting changes in the navigational aids to best adapt to the new conditions and assure the most effective and reliable system for all users.

c. The Coast Guard is responsible for the safety of life and property at sea. The policy is to provide search and rescue to the greatest extent possible by early recognition of the changes and shifting of centers of vessel activity, and the necessary deployment or relocation of forces to or near such areas to provide the maximum utilization of available resources within minimum time element.

d. The Coast Guard has similar responsibility in the field of recreational boating, together with enforcement of the federal regulations on the operation of these craft. The primary policy is to maintain an aggressive educational program on boating safety and compliance with regulations, in close liaison with state authorities, public service groups and the industry.

e. The Coast Guard has responsibility for the establishment of anchorage areas and the governing regulations. The policy is to define anchorage areas which will promote the orderly use of a port on the most equitable basis to the maritime community.

f. The Coast Guard responsibility with respect to merchant vessels is to administer and enforce the inspection and navigation laws. This involves requiring and verifying the structural adequacy of vessels and their equipment; also establishing standards and requiring the demonstration of the competency of the personnel. The policy is to assure that high standards of material and operational safety are maintained in the public interest and to fulfill U. S. treaty obligations.

g. The Coast Guard is responsible for the administration of draw bridge regulations and the review of plans for the construction or alteration of bridges. The broad aspect of this function, as they relate to the Department of Transportation, must provide for the overall benefit of all modes of transportation. Consequently, the policy is to provide equality between rail, highway and water users in the matter of bridge regulation.

h. The Coast Guard is responsible for the administration and enforcement of laws and regulations providing for the safety and security of ports. To promote the safety of water front facilities, and vessels, the handling of dangerous cargoes, and the improvement of the port to assure continuous availability of marine transportation, the policy is to provide continued daily active surveillance, and visitation with marine interests, with emphasis on education: to encourage early detection and prompt correction of material conditions or operational practices that may endanger life and property.

As will be noted, the Coast Guard policy has been to recognize and reconcile the diverse demands of the various modes of transportation — rail, highway, water — and types of vessels -- commercial and pleasure -- in the administration of many of its missions. The Coast Guard can thus provide to the study information on problems and conflicts in the use of estuarine resources as relates to navigation, water pollution, and recreational boating.

CREMONA FARM

MECHANICSVILLE
ST. MARY'S COUNTY
MARYLAND 20659
301--884-3140

NORTON T. DODGE

November 12,1968

STATEMENT

to

Federal Water Pollution Control Administration, Maryland Department of Water Resources, and District of Columbia Department of Sanitary Engineering

by

Dr. Norton T. Dodge

Introduction

I am a member of the Economics Department of the University of Maryland, but I speak here as a concerned citizen living on a farm on the shores of one of the Bay's most beautiful estuaries, the Patuxent River. I also speak in behalf of the Patuxent River Citizens Association. I should also point out that for the past four minths I have served as Vice-Chairman of the Study Committee appointed by the Board of County Commissioners of St. Mary's County to evaluate the proposed development of a Foreign Trade Zone and petroleum refinery at Piney Point on the Lower Potomac. As you may know, our Committee recommended against the establishment of the proposed refinery. In its report, the Committee also made some recommendations relevant to the concern of these hearings. A number of them will be mentioned in my statement along with recommendations of my own.

Recommendations

Our estuaries are more than a valuable water resource; they are a priceless natural heritage which the present generation has an obligation to use wisely and to preserve for posterity. Each city, power plant, industrial plant - each and every citizen - must share in that responsibility. In the interest of preserving the unique and valuable water and recreational resources of the Bay and its tributaries, the following recommendations are offered:

1) Over-all planned land use or zoning should be established for the Bay and its tributary estuaries. Further study is required to determine the best mechanism for carrying out land use planning and zoning. It is possible that an interstate body with federal representation should be established for this purpose, utilizing, perhaps, existing agencies such as the Maryland Board of Natural Resources as a component of the interstate board. Perhaps plants of certain types or size could be located with the approval of only a state board. It seems clear, however, some over-all authority is required since local governments have notoriously not been able to protect the best interests of their own citizens much less that of

neighboring counties which may be adversely affected without any tax or other benefits.

It seems clear that wise and farsighted planning of the multiple uses of the Bay and its tributaries will be required to preserve it intact for all of its valuable uses, particularly for the production of seafood and recreation. It would be the height of irresponsible and shortsighted management if the enjoyment of the general public of this and future generations were sacrificed to the immediate interests of those wanting to exploit the Bay at the expense of its other uses. There is ample land and locations in Maryland and Virginia in already industrialized areas to serve all of the foreseeable development requirements for many decades to come.

2) Laws should be passed in Maryland and Virginia requiring the granting of water use permits prior to rather than after construction is begun on a project. Only if such legislation is passed can effective control of land use and the location of power plants and other industries be effected. It is ludicrous to see agencies of the state with the responsibility of protecting the public interest powerless to act in the face of fait accompli by by three quarters constructed power plants which threaten to have to turn of the lights if not permitted to go into operation.

3) Laws should be developed to aid in the control and reduction in damage from oil spills. In particular, petroleum loading and unloading facilities should be required to have available in case of need various protective devices such as floating booms to surround the ship or barge and other mechanisms for cleaning up any spill which might occur. A number of these are mentioned in the report of the Commissioners' Study Committee refered to above. Chemical should also be available to aid in the clean-up operation, but these should be non-toxic to marine life. The main aim, of course, should be to reduce the incidence of spills. Therefore, seriouse consideration should be given to legislation preventing the loading and unloading of petroleum products under adverse weather conditions and, possibly, during the hours between sunset and sunrise.

4) Stricted controls and heavier penalties should be established to reduce pollution from the pumping of bilges. In certain harbors and at certain facilities provision should be made for pumping bilges ashore for treatment or into barges which could move from ship to ship.

5) Consideration should be given to spelling out in greater and more specific detail what is admissible in industrial discharge. Present law put too much onus on the state control agencies and to little upon the source of the problem. These more specific and detailed standards should be applicapable to the waste discharge itself so that the receiving water is not itself a part of the treatment process.

6) Present water quality control agencies and other state agencies concerned with marine research and resource management are inadequately staffed and financed. The strengthening and coordination of the agencies responsible for maintaining the quality of the resources of the Bay and its tributaries for the general public both now and for the future is urgently needed.

Respectfully submitted,

Norton T. Dodge

ND:s

STATEMENT FOR PRESENTATION AT THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
ESTUARINE POLLUTION AND CONSERVATION HEARING, OCTOBER 30, 1968, FRANCIS
SCOTT KEY AUDITORIUM, ST. JOHNS COLLEGE, ANNAPOLIS, MARYLAND

By

THE MARYLAND STATE SOIL CONSERVATION COMMITTEE, SYMONS HALL, COLLEGE PARK
MARYLAND AND THE MARYLAND ASSOCIATION OF SOIL CONSERVATION DISTRICTS,
H. J. PATTERSON HALL, COLLEGE PARK, MARYLAND

The Maryland State Soil Conservation Committee, the Maryland Association of Soil Conservation Districts and the twenty-four individual Soil Conservation Districts draining into the Potomac River and Chesapeake Bay in Maryland are vitally interested in the Chesapeake Bay. The Soil Conservation Districts have active conservation programs which have direct bearing on the quality of the waters of the estuary.

Since 1938 the Soil Conservation Districts have been involved in programs to control soil erosion and run-off. Until recently, these activities have been predominantly centered on protecting the agricultural land. ~~and~~ Large areas now have adequate treatment. In recent years, however, as land has gone out of agriculture, soil erosion and subsequent sediment problems have shifted to these urbanizing areas. With the assistance of federal and state agencies, Soil Conservation Districts have taken the leadership in encouraging procedural arrangements in their various counties to reduce erosion and sediment during urbanization. Sediment control programs are now in effect in Montgomery, Prince George's, Anne Arundel, Howard, and Baltimore counties; similar programs are under development in other counties. The implementation of sediment control programs will have a desirable effect in reducing sediment flow into estuarine waters. We urge support of needed research to improve these sediment control programs.

Also affecting the estuary is the Small Watershed Program under the Watershed Protection and Flood Prevention Act of 1954 administered by the United States Department of Agriculture, Soil Conservation Service. The State Soil Conservation Committee reviews all applications for assistance to the watershed program. The Soil Conservation Districts, the County, Watershed Associations or other groups sponsor all applications and carry out the land treatment and other measures. Two types of programs are in effect in Maryland. Under the Watershed Program west of the Bay, impoundment type structures are used to control the run-off of flood waters and to store sediment. Combined with land treatment, these structures are very effective in further reducing the sediment flow downstream, trapping more than 90 percent of the sediment which enters the impoundment.

East of the bay, due to the topography this program largely involves channel improvement to reduce floods and improve drainage of agricultural lands now in production. The effect of these channels on agricultural production is well known and of considerable economic importance to Maryland. On the other hand, their effect on the estuary and related resources is not so well known and is considered contraversial, by fish and wildlife interests.

In view of the importance of agricultural drainage to the economy we urge an objective study of these effects with appropriate recommendations.

Reproduced from best available copy.

Statement by Walter C. Boyer
Deputy Director, Maryland Port Authority
before
Meeting Convened by Federal Water Pollution Control Administration
Pursuant To
Clean Water Restoration Act of 1966

* * *

October 30, 1968

* * *

The initial portion of this statement is largely a condensation of the Position Paper delivered by W. Gregory Halpin, Deputy Director, Maryland Port Authority, before the Governor's Conference on the Chesapeake Bay, Wye Institute, Maryland, September 12, 1968.

One hundred fifty miles of water link the Port of Baltimore to the Atlantic Ocean via the Virginia Capes, and one hundred twenty-five miles connect Baltimore and the Atlantic via the Delaware Capes. In both instances, the passageway from Port to ocean is the Chesapeake Bay. Thus Maryland's greatest natural asset is the key that unlocks the door to Maryland's greatest commercial asset.

It is doubtful whether there would be many, if any attending this meeting who would dispute the fact that the Bay is the State's foremost natural asset. Representing the Maryland Port Authority and the maritime interests of the Port of Baltimore, I would hope that there would also be unanimous agreement that the Port is the State's greatest commercial asset.

The urgent problem we now face is whether these two entities, Bay and Port, can continue to function and grow as compatible rather than competitive factors in the State's economic life.

More than 10,000 times each year, the waters of the Chesapeake Bay are churned by the powerful propellers of ocean-going vessels voyaging to and from the Port of Baltimore. These vessels, carrying cargoes from all corners of the world represent a maritime commerce totaling more than 40 million tons annually. The economic impact of their activity accounts for 11.8 percent of Maryland's Gross State Product of $13.4 billion. They are part of a giant complex of facilities, machines and manpower that link Maryland to the world and form the base for her major metropolitan area.

There can be no great benefit in spending excessive amounts of time belaboring the importance of the Port to the economy of the State. It will be far more fruitful to closely examine the Port's present position and attempt to analyze some of the current and future competitive factors challenging the Port. This examination may lead us to a conclusion whether the State can continue to rely on the Port as a growth industry.

At the same time, in this particular setting we should turn careful attention to the impact of maritime activities on the Bay itself. Many are increasingly disturbed over the effects of pollution and spoil disposal on the other uses and functions of the Bay, particularly as they relate to commercial fishing and recreational activities. The time is certainly pertinent to put the role of the Port in proper perspective.

The Port of Baltimore is now emerging from a post-World War II period during which its status as a leading world center for maritime commerce has been seriously threatened and challenged. It is entering a new period of growth and expansion, complicated by revolutionary, new techniques and methodology in the steamship industry.

Port business is a competitive business. This is particularly so in the North Atlantic range, which includes Baltimore. As soon as one challenge is met, another of greater proportion arises. There is the unending pressure from neighboring ports. During the period when Baltimore has spent some $50 million to $60 million on the development of facilities, New York has spent $500 million to $600 million. During the same period, Norfolk has spent somewhat less than Baltimore but is accelerating programs for development. Philadelphia is now committed to a 10-year, $100 million program.

Recognizing the need of accelerating the pace of progress, the Maryland Port Authority produced a 10-year program. The program, costing an estimated $67 million will, over the period 1967 thru 1977, result in the construction of as many as eight new berths, the rehabilitation of some still obsolete berths and the acquisition of important waterfront property. The program, with full legislative approval and additional financing, is now well underway, approximately 40% of the funds now having been committed to project work in various stages of completion.

The central planning feature of the program is to provide the Port with facilities for the handling of containerized cargo. Containerization, simply put, is the consolidation of many loose packages or articles of freight into a standard size box. The box, in turn, can be handled as a unit on a rail car, a truck and a ship. Using sophisticated and highly costly mechanical handling equipment, a containerized cargo system can reduce United States to Northern Europe travel time by as much as one-half. It can, at least in theory, reduce pilferage of cargo to zero. It can and it has revolutionized the steamship industry.

For the past year, Baltimore and Hampton Roads have been waging a very intensive skirmish to determine who will be the second major container port. As of today, Baltimore has a slight edge. This is due to the fact that facilities are sufficient at the moment and improving rapidly to handle containers and because the larger volumes of general cargo have traditionally moved thru Baltimore.

The most careful analysis of the future would indicate that Baltimore has an excellent chance of maintaining and increasing its lead over Hampton Roads; provided, however, that the Chesapeake and Delaware Canal project is brought to a rapid conclusion.

It is easy to see that Baltimore will not attract container cargo that is forced to sail down the Atlantic Coast bypassing the front door of its competition at Hampton Roads and steam an additional 150 miles up the Chesapeake Bay facing a similar return trip. The disadvantage of this type voyage is that it places Baltimore 300 miles further away than Hampton Roads from European ports and adds a minimum of 20 hours sailing time. This additional distance and time cannot be tolerated under the stress of tight container schedules.

Therefore, Baltimore port interests are exerting every effort to speed the completion of the C&D Canal project which is now scheduled for 1971. The Canal, deepened and widened, with bridges raised and dangerous bends eliminated, will be a safe and speedy access for the newer, larger container vessels. The Canal will actually place Baltimore several miles closer to north European ports than Hampton Roads.

The importance of the C&D Canal project brings us to a crucial point in these discussions. It is one thing to build millions of dollars worth of new facilities, and it is another to promote the Port all over the world. But unless the Port has sufficient access it will become an isolated waterfront monument to frustrated public spending.

The past 10 years has seen two major projects designed to improve access to the Port. The first of these was the longsought deepening of channels serving Baltimore Harbor from 39 feet to 42 feet. The other was the project still underway - the C&D Canal. The study into determining the economic feasibility of deepening the channel beyond 42 feet is now underway. The actual work on the 45-foot channel is taking place at the competitive ports of Hampton Roads.

Unfortunately, material dredged from the channel areas at Baltimore is spoil rather than fill - a liability rather than an asset. As channels have been deepened, new channels dredged and annual maintenance dredging increased, the capabilities of such spoil disposal areas as the Kent Island Dump have reached their maximum limitations. Indeed, were it not for civic minded contributions by Kennecott Copper and the Baltimore & Ohio Railroad in allowing spoil to be placed in front of their properties in the Hawkins Point area, the 42-foot channel might still be in the planning stage rather than a reality.

In recent months the Authority, the Corps of Engineers, and officials of many State agencies have been studying the problem of where to dispose of spoil from present and future projects. The matter is still unresolved. The problem of where to dispose or disperse spoil has been and is today an immense problem. Part of the problem stems from lack of real or conclusive knowledge on the effects of this material on marine life and the natural resources of the Bay. Without spoil disposal there would be no spoil, and without spoil there would be no new or deeper channels. This, in turn, will lock and limit the Port. This, in turn, will limit the economy of the State as nothing else can or will.

I think it should be clearly understood that there are some limitations to the scope of the utilization of the Bay by the port industry. Much has been said lately about the super-tanker or super-carrier. These are vessels which are now being built in the dimensions of 300,000 dead weight tons. The million-ton tanker has now been declared technically feasible. These mammoth ships require extraordinarily deep channels well beyond 60 feet or 70 feet.

It is virtually inconceivable that the Chesapeake Bay will ever see such a ship. The bridge-tunnel connecting the shores of Virginia acts as a picket line defense against such vessels entering the Bay. Allowing for a cut in the protective cover over the tunnel portion of this facility, the maximum channel depth would be 60 feet, resulting in a maximum allowable draft of 55 feet entering the Bay through the Virginia Capes. Further, economics would rule against dredging the channels to such a depth.

To the north, the C&D Canal, dredged to accommodate ships of 55-foot draft, would require additional Federal expenditures of close to $1 billion. No one is prepared to predict that such monies would ever become available. Further, world-wide maritime planning calls for such super-tankers to load and discharge offshore with possibly one or two exceptions - namely, Rotterdam, which can provide at least 65 feet, and a yet-developed harbor/area on the Maine coast of the United States where 90 feet of water has been discovered.

It now appears that the natural and economic barriers will limit use of the Bay to vessels of 200,000 dead weight tons.

For Baltimore, however, it is critical that sufficient draft be provided so that the newest of general cargo ships, whether they be container or more traditional general cargo ships, can call at the Port. Further, sufficient draft must be provided for the largest possible ore ships that can call at Sparrows Point, Bethlehem Steel and at the ore and grain docks. It is imperative, therefore, that a long-range solution be found to the problem of disposing of spoil in the Chesapeake Bay area. The areas must be developed in locations that will maintain dredging costs within economic reason. It might be noted that non-maritime projects such as the second harbor tunnel are directly affected by dredging costs.

Glib solutions such as "carry the spoil to the ocean" cannot be accepted without accepting the consequences of such a solution. Spoil can be disposed of in the Kent Island Dump presently at a cost of about $1.50 per cubic yard. Disposal in the ocean would raise this cost to about $6.00 per cubic yard. To impose such a condition on State public works can result in burdening the taxpayer with excessively high costs. However, such costs can result in the virtual elimination of Federal projects, and privately financed industrial development in the Port of Baltimore. This is indeed a dim prospect, in a period that is growing ever more competitive.

However, we at the Authority are fully convinced that the Port's future prosperity need not be gained at the expense of any other facet of State activities, including and particularly those activities centering around the Chesapeake Bay.

We can have cargo and crabs. We can have oilers and oysters.

We can use the Chesapeake Bay as a passageway for world commerce and as a great recreational resource. Indeed, we must do both of these things, and if the Port cannot grow and expand, the future potential for all other activities in the State will proportionately shrink.

Having cited a most serious problem faced by the Port, perhaps a brighter side may be presented by discussing the Maryland Port Authority's program to control pollution in the Patapsco River.

Through agreement with the City of Baltimore, the Maryland Port Authority carries out certain functions, obligations and requirements established by Baltimore City ordinances pertaining to the control of pollution caused by oil products such as oil, naptha, benzene and kerosene, along with material, refuse or matter of any kind which may fall or be washed into the waters of Baltimore Harbor. This includes an obligation and authority to remove such deposits from the harbor waters. The Baltimore City ordinances, which now have the status of regulations of the Maryland Port Authority, make no distinction between pollution from a shore installation and pollution from a ship. This is at variance with the present State and Federal laws controlling oil pollution. We would like to see equal treatment given, as it is in Baltimore, to the control of oil pollution from any source, whether it be on a shore installation or a ship installation.

The Maryland Port Authority has been and is now actively engaged in removing floating debris and oil pollution from the waters of Baltimore Harbor. As part of the recovery system, the Maryland Port Authority recently received as a donation some 3,000 feet of oil retaining boom, along with a supply of chemical dispersants, purchased on the cooperative and coordinated efforts of 13 local oil companies. This equipment cost these oil companies in excess of $21,000.

We own and operate a self-propelled barge designed and equipped to remove oil from the surface of the water by the rotary drum process and to store the recovered oil in the tanks of that vessel. This barge, further, has a capability of pumping oil from its cargo tanks into supplemental storage tanks, if and when the additional storage capacity is needed. This vessel, which was acquired in 1962, at a cost in excess of $80,000, has proven most effective in removing oil pollution from the waters of Baltimore Harbor, but it cannot be effectively used in seas higher than two feet, nor will it efficiently remove gasoline or kerosene from the surface of the water.

The Maryland Port Authority also owns and operates a $25,000 debris recovery vessel equipped with a hydraulically operated front end loader for removing solid floating debris. By strewing straw or sawdust on an oil spill, this vessel can also be used in oil recovery operations in calm waters.

It is the practice of the Maryland Port Authority to physically remove polluting material from the water - the chemical dispersants are only used in the final cleanup stages of an oil recovery operation. Our facilities, coupled with the debris recovery vessel of the Corps of Engineers, give Baltimore a harbor cleanup capability equal to, or better than, that of any port in the United States.

It must be clearly understood that the oil and debris recovery facilities in Baltimore were designed for the work in this harbor where they have been most satisfactory. However, our facilities cannot be effectively used in the waters of Chesapeake Bay except in ideal weather conditions, and they could not be used in any open sea operation.

During the past five years, the Maryland Port Authority has investigated 41 oil spills; 26 of which were caused by shore installations and 15 of which were caused by vessels. Of the 41 investigated spills, our oil skimmer was activated and was successful in removing oil from the water in 19 cases. In the 22 cases where the skimmer was not activated, it was because the spill was not extensive enough to warrant the deployment of our forces or because it could not be handled by our equipment, i.e. a gasoline or kerosene spill.

Of the 19 instances where the oil recovery barge was activated, we were able to determine the identity of the vessel or shore installation which caused the spill in 11 cases. The owner or operator of the vessel or shore installation responsible for that spill was then billed for cleanup services. In no instances has any owner or operator yet failed to pay our $100 an hour charge for our oil cleanup service. Between 1963 and 1968 the Maryland Port Authority has collected a total of $11,742 for its oil recovery work.

We estimate that approximately 65% of the floating pollution (oil and debris) on the waters of Baltimore Harbor is introduced through the City's storm drainage system. We hope to be able to develop suitable traps around the outlets of the storm drains to concentrate oil and debris for our cleanup facilities and prevent this debris from entering the harbor waters. This is a research and development problem where we will probably look to the FWPCA for financial assistance.

Perhaps the ultimate objectives of the program just outlined can be best illustrated by citing the recommendations of the Advisory Committee on Bay Pollution which are:

1. Changes in Maryland Laws

It is the recommendation of the Committee that the laws of Maryland pertaining to oil pollution give equal treatment to ship and shore installations. It was evident during the study that shore installations have caused many more pollution incidents than ship installations.

2. Violation, Detection and Enforcement

The Committee found that all Maryland laws pertaining to pollution either from oil or sewage, were being violated. Although the apprehension of culprits is often difficult, many more convictions could be obtained by increasing the level of pollution detection. Pollution detection could be increased by self-monitorin pollution detectors which our current technology can produce, and/or by the increase of human observers in the pollution field.

The violation-detection-enforcement should concentrate on this: 1) sewage pollution, 2) shore oil installation pollution, and 3) ship pollution -- in that listed order.

3. Waste Disposal

A potentially major source of Bay pollution exists in the disposal of waste petroleum products from retail gasoline and automobile service stations. Various waste oil disposal facilities and services are available to the retailing oil industry. Publication and promotion of these facilities should be made known to the retailing oil industry. The licensing of collectors of waste oil should be undertaken by legislation. The efficiency of waste oil traps used in retail oil service stations should be specified by State law and the inspection of oil traps should be undertaken by a State agency. Final disposal of waste oil should be under the cognizance of a State agency and should be controlled, otherwise the pollution problem may just be passed from one person to another. The oil industry should be encouraged to investigate the incineration of waste oil products. This potential solution to waste oil disposal, however, is fraught with potential air pollution problems.

The investigation of a central marine waste oil collection system under the authority of the Port of Baltimore should be undertaken. In general, waste disposal should be made easy for the homeowner, the industrialist, the shipowner and the general public. Where wastebaskets are in evidence, wastepaper is not.

4. Major Oil Spill Emergency Planning

The Department of Water Resources is coordinating oil spill emergency planning with all State agencies, including the Marine Police and the State Police. Publication of a concrete plan should be given wide distribution to the oil industry, the marine industry and the general public. The Department of Water Resources should recommend to the legislature an appropriation to place oil-containing booms and oil cleanup machinery at several locations within the Bay. The only cleanup machinery existing at present is at the Port of Baltimore.

5. Bay Management

Many, many agencies of the State of Maryland and of the Federal Government have cognizance over some portion of Chesapeake

Bay affairs, pollution, water resources, recreation and transportation. The efforts seem to be uncoordinated and at times, at direct cross-purposes from one agency to another. It is the opinion of several members of the Committee that the Bay should be managed from one central agency and should be treated as a system for such management. This agency could be responsible for the Bay as an entity and we are sure, secure Federal and State funds for such management. Such a management could bring to bear and could coordinate all of the various State and Federal activities which pertain to the Bay.

Statement by John T. Starr
Baltimore District, Corps of Engineers
at the
Public Hearing on the National Estuarine Pollution Study
Annapolis, Maryland
30 October 1968

The world's estuaries afford protective harbors, significant amounts of food, and vital transportation links between inland agricultural, industrial, and commercial areas and the routes of commerce on the high seas. A good number of the great industrial and commercial cities of the world are located on estuaries. The well being of millions of people is intimately tied to both the natural phenomena of estuaries and their uneasy relationship with the often disruptive activities of man.

The works of man in an estuary's drainage basin can have profound and lasting effects. Upstream impoundments and interbasin transfers of fresh water can materially affect salinity concentrations in estuarine water, the ecology of aquatic life, and the flushing of the estuary. Agricultural practices and construction activities accompanying the rapid rate of urbanization accelerate geological processes by multiplying many times the natural sediment inputs to estuarine systems. Industrial, agricultural, and urban activities introduce large amounts of nutrients, toxic materials, and other deleterious substances into rivers and bays, greatly affecting biological activities in the marine environment.

The water-use conflicts expected in the future are for the most part already apparent, and provide a means for forecasting the magnitude and extent of the challenge which must be met. A partial listing of present and future conflicts would include:

Municipal & industrial wastes, thermal loads	vs	Clean water, aquatic life, recreation
Land & shore development	vs	Wetlands, recreation legal implications of bay bottom ownership and water itself
Sediments from Urbanization Agriculture Dredge spoil disposal	vs	Aquatic life, navigation preservation of wetlands
Commercial fishing	vs	Species survival, sport fishing recreation boating, land uses
Debris	vs	Recreation

These conflicts are only a few of the many known relationships. Actually, the competing uses considered singly and in groups comprise an endless variety of combination of stresses on an ever-changing and extremely fragile system.

Chesapeake Bay is an excellent example of such a system. It is the largest estuary on the Atlantic Coast of the United States and one of the important estuaries of the world. It produces large crops of estuarine species, the most important economically of which are the soft-shelled clam, oysters, blue crabs, menhaden, and rock fish. In recent years the commercial catch has exceeded one-half billion pounds annually, and is valued yearly at more than $65 million. The quantity of fin-fish landed by sport fishermen possibly exceeds the entire commercial catch. Commercial fishing provides a means of livelihood for approximately 10,000 persons, and sport fishing is enjoyed by many thousands.

This is, however, only a small part of the value of Chesapeake Bay as a natural resource. Waterborne commerce, totaling 110 million tons annually, moves over the waterway and contributes, in large measure, to the economy of an 11-state area, extending into the Midwest. With the trend toward larger ships, which in turn will require deeper channels, greater problems are being posed in locating dredge spoil disposal areas. Modifying channel geometry may cause increases in upstream salinity, and unwise disposal of spoil can have marked effects on living marine organisms.

The population of the immediate Chesapeake Bay area was approximately 3.8 million in 1960, and is expected to double by 1985. The Bay area contains rich farmlands, far-stretching woodlands, and intensively developed industrial areas which are steadily increasing in importance. As an example, the largest steel making plant in the world is located at Baltimore near the head of the Bay.

The rapid increase in population and the accompanying rapid increase in water-oriented pursuits have resulted in problems concerning the optimum management of the Bay resources. The basin includes developed areas which sustain a vigorous economy and other areas where the economy is depressed as a result of technological changes. The development of resources is essential in both kinds of areas; for the first, to maintain and expand existing economic activity, and for the latter, to stimulate development through the creation of an important element of the base upon which new economic activities can grow. In depressed areas, industrial development and recreation (considered as an industry) are expected to be prime factors in economic development. Elsewhere in the Bay area, several of the major water-using industries are expected to grow as fast, or faster, than the National rate for such industries, creating demands for water of adequate quantity and quality.

With more intensive urban development, problems associated with water resources management in urban areas become both acute and complex. Of primary concern are the nutrient and chemical loads to which the Bay system is increasingly being subjected. An excess of nutrients frequently leads to explosive blooms of algae and to stimulating the growth of noxious aquatic weeds which triggers other problems. Noxious weeds tend to trap silt, potentially causing a shoaling problem. They make it impossible to operate small boats in areas which are heavily infested, and they otherwise affect the recreational and aesthetic uses of waterways. Damage done to the estuary by excess nutrients is virtually irreversible because of the continuous recycling of the nutrients.

There are other significant threats to the Chesapeake Bay environment. These include both inter and intra-basin diversions of fresh water. Fresh water diversions can alter the salinity regime of the headwaters of the Bay, affecting the spawning opportunities of many species of fish. The destruction of wetlands through filling for urban development can destroy areas that in some cases are many times more productive of food than the best farmland. This destruction will have a marked effect on food and cover for water fowl, as well as the supply of organisms upon which fish feed.

Urban construction skins the earth's surface and sometimes increases sediment yields a thousand fold. Where they enter the Bay, these sediments can smother bottom life and otherwise create aesthetically objectionable conditions. Shore and bank erosion, over the centuries, have removed much fine agricultural land, and a number of islands in the Bay have disappeared. Increased impervious area, resulting from urban construction, increase both the magnitude and frequency of flooding. This can have a decided effect on water quality in the estuarine environment. There are few existing data on the quality factors in urban storm water runoff.

Rapidly expanding electrical power requirements and the resulting demand for larger power plants are requiring use of large volumes of estuarine water for cooling purposes.

Recognizing these many and inter-related problems as they pertain to Chesapeake Bay, the Congress, in Section 312 of the River and Harbor Act of 1965, authorized and directed the Secretary of the Army, acting through the Chief of Engineers, "to make a complete investigation and study of water utilization and control of the Chesapeake Bay Basin, including the waters of the Baltimore Harbor and including, but not limited to the following: navigation, fisheries, flood control, control of noxious weeds, water pollution, water quality control, beach erosion, and recreation. In order to carry out the purposes of this section, the Secretary acting through the Chief of Engineers, shall construct, operate, and maintain in the State of Maryland a hydraulic model of the Chesapeake Bay Basin and associated technical center."

The study has been assigned to the District Engineer of the Corps of Engineers in Baltimore.

Such a study of the water and related land resources of the Chesapeake Bay area requires a great diversity of technical, scientific and social skills. No one entity has within itself sufficient expertise to make a study of this scope and magnitude. There is, however, great capability within the various governmental agencies and the educational and research institutions of the Chesapeake Bay area to generate the requisite personnel to pursue a study of this magnitude and scope. The State of Maryland and the Commonwealth of Virginia support progressive state planning departments and water resource study and management departments that have been working on Bay problems for a long time. Agencies of the Federal Government which have been engaged in Chesapeake estuarine affairs include, in addition to the Corps of Engineers, many of the component parts of the Department of Agriculture, the Department of Health, Education, and Welfare, and the Department of the Interior. Our on-going study of the Bay is conceived, therefore, not only as a multi-discipline, but as a multi-agency effort - a coordinated partnership among Federal and State agencies and educational institutions.

Toward this end and to facilitate the harmonious combination of these talents, an Advisory Group has been established. It is composed of representatives of the Departments of Agriculture, Commerce, Health, Education, and Welfare, Housing and Urban Development, the Interior, the Navy, and Transportation, the Federal Power Commission, the Atomic Energy Commission, the National Science Foundation, the Smithsonian Institution, the State of Delaware, the State of Maryland, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, and the District of Columbia.

This group, known as the "Advisory Group on the Chesapeake Bay Study," is convened as a body at such times in the course of the investigation as is necessary to furnish advice and guidance to the District Engineer and his staff, to coordinate study efforts, and to review and comment on the course of the study.

The hydraulic model and its associated technical center, the site of which is at Matapeake on the Eastern Shore of Maryland, will present an excellent opportunity for productive cooperation in estuarine research, engineering, and management. The scales of the model are 1 to 1000 horizontally and 1 to 100 vertically, which are the smallest practical scales experience has shown to be suitable to solve the many problems associated with Chesapeake Bay. It will encompass the Bay proper, all of its tributaries up to the head to tidal effects, and the adjacent overbank areas to the contour of 20 feet above mean sea level.

These geometric scales result in a time scale of 1 to 100, which means that a semi-diurnal tidal cycle of 12 hours and 25 minutes will be reproduced in about 7 1/2 minutes, and a year of record in nature will be simulated in the model in a bit less than 4 days of continuous operation. The model will also allow the simulation of many combinations of natural conditions, including fluvial discharges from tributary rivers. Mathematical models will be utilized in the study to the extent that present model technology will permit.

With its long-time involvement in the study of estuaries, the Corps of Engineers is extremely interested in the National Estuarine Pollution Study which was authorized by the Clean Water Restoration Act of 1966. It ties in with the Chesapeake Bay Study which is now underway, with many of the same agencies taking part directly in both studies. As was noted above, the Department of the Interior, including the Federal Water Pollution Control Administration, and the States of the Chesapeake Bay area are working partners in the Chesapeake Bay Study. In fact, the Federal Water Pollution Control Administration is the chairman agency of one of the Study's task groups on Water Quality and Supply, Waste Treatment and Noxious Weeds.

Any data gathered and any studies made for the Chesapeake Bay Study will, of course, be available for the Estuarine Pollution Study, including studies made with the hydraulic model. You may be assured that we will cooperate in your study effort in any way we can.

WATER QUALITY AND PLANNING FOR THE CHESAPEAKE BAY

by

John H. Cumberland

October 29, 1968

The basic problem in maintaining water quality in the Chesapeake Bay is the weakness and lack of coordination of the government agencies responsible as compared with the strength and magnitude of the growing pressures for deterioration and exploitation of the Bay. This statement deals primarily with the State of Maryland, but it is also relevant to conditions in Virginia. Obviously, the two states need to coordinate their efforts with each other and with the Federal Government.

The very lack of capability and strength of purpose of the agencies responsible for resource management in the Bay encourages its exploitation and degradation by private interests. If lack of good management in Maryland, Virginia, and the Federal Government give evidence that excellence in Chesapeake Bay resource management is not a major objective, it is not surprising that potentially alert exploiters, not only from the region but from all over the world, will focus their attention on the Bay. For example, there is some evidence that Maryland's failure to protect its water resources from power plant thermal pollution is attracting widespread attention of East Coast electricity producers to the Bay as a weakly regulated area ripe for exploitation as a power exporter to other regions. The State has been urged to halt this damage by surveying optimal sites and establishing its own water management policy, for minimizing environmental damage,[1] but the State has failed to act.

Similarly, if the small rural tidewater counties around the Bay sense a lack of concern for quality consideration in their neighboring counties, it is unreasonable to expect them to forego financial temptations from industrial propositions.

Yet from any long run evaluation of economic trends in income, leisure, and recreation, it is clearly in the best interest of Maryland to confine industrial development to existing industrial areas, and to protect the priceless Bay and its tributaries so that these regions will be able both to serve recreational needs and enjoy the much greater prosperity and affluence which is inevitably coming to those regions wise enough to protect their water resources from deterioration. From the viewpoint of the State, it is the height of folly and mismanagement to let slip away the rapidly approaching opportunities for affluence and enjoyment of the general public who are beginning to prize the Bay resources by succumbing to the short run temptation to benefit those wanting to exploit the Bay to serve their immediate interests. There is ample land and sites in the State in already industrialized areas to serve all of the foreseeable economic development needs of the State for many generations.

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[1] University of Maryland, Water Resources Management in Maryland, Water Resources Study Committee, College Park, 1967, pp. 7-8.

The problems of protecting the Chesapeake so that it may serve the higher uses of the general public then reduces to these basic needs:

1. Finding ways to meet the legitimate public and private economic needs of local areas so that they will not need to feel pressured into unwise competitive development projects.

2. Strengthening and coordinating the agencies responsible for maintaining the quality of Bay resources for the general public over the long run.

Provision of Incentives to Local Areas for Excellence in Resource Management

Meeting the economic needs of local tidewater counties without forcing them into competitive development is already proceding and can be improved. The major device for achieving this is the establishment of statewide standards for public services in schools, health programs, and other public programs through revenue sharing and other measures, so that excessive dependence upon the local property tax is avoided. Maryland is already making progress in this direction. Tidewater counties can reasonably expect to receive shared revenue from the State and nation to bring its public services up to standard levels in return for protecting the State's valuable water resources and providing an environment for recreation and good resource management. State efforts, aided by federal programs, to share revenue with counties of less intensive economic development should be pushed vigorously.

Strengthening State Resource Management Programs

Strengthening of state resource management agencies is urgently needed, and should have top priority among state needs. The Board of Natural

Resources has legislative responsibility for coordinating state resource policy and programs. Unfortunately, it has neither the expert staff nor an adequate budget needed to discharge these vital functions.[1] An objective study should be made of the budget and staff needed by this key agency to meet its natural resource responsibility in the state.

Effective management of state resources policy by the Board of Natural Resources would specify that before any development of any kind that affected resources was permitted, the developers, public or private, would be required to submit a life-cycle plan, detailing plans for preventing resource damage during the construction, development, and operating phases of the development.

The State Department of Planning is now moving towards a planning process for Maryland. This is badly needed and long overdue. As part of the State plan, more concern with physical development than has previously been considered is essential. Local physical planning and zoning responsibilities now reside in county and municipal governments in the State. However, there is obvious need for coordination among local planning agencies and for establishment of minimum standards that is now being neglected.

Coordination by a responsible state agency is particularly required over the operation of the Department of Economic Development, and the Maryland Port Authority as the recent Piney Point oil refinery proposal demonstrated. These agencies, in pursuing their own internal programs, can have massive effects upon regional planning and resource management in Maryland even though they are not equipped by legislative authority or staff capability to deal with the consequences of their programs. The State currently has inadequate powers of control and public review of actions taken internally by these agencies in their expenditure of public funds and with regard to their effects upon local citizens and their environment. Planning of roads, highways, and bridges is also in urgent need of more review and participation by the citizens and regions affected.

In summary, if Maryland and other jurisdictions concerned with the Chesapeake Bay are to achieve any measure of control over its quality and resource management, action must be taken to give top state planning and resource management agencies the staffing, budgets, and authority to establish long-run plans, priorities, and quality standards and to enforce them in the public interest with a strong commitment to excellence in natural resource management and environmental quality.

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[1] Recently, the State Department of Water Resources, in a constructive effort to expand its budget and staff, had an outside study of its needs made by the University of Maryland. As a result of study recommendations, the Department was given substantial increases in its budget to meet the expanded responsibilities facing the Department. This procedure might be appropriate for the Board of Natural Resources.

OFFICES OF
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ONE CHARLES CENTER
BALTIMORE MARYLAND 21201

FRANCIS B. BURCH
ATTORNEY GENERAL

October 30, 1968

Mr. Eugene T. Jensen
Regional Director
United States Department of the Interior
Federal Water Pollution Control Administration
918 Emmet Street,
Charlottesville, Virginia 22901

Dear Mr. Jensen:

I have your letter of October 4, 1968 regarding the joint meeting being sponsored by the U.S. Department of the Interior to be held in the Francis Scott Key Auditorium, Saint Johns College, Annapolis, Maryland on October 30th at 9 a.m. Unfortunately I cannot be present for the meeting, however, I would like to submit the following statement:

The Clean Water Restoration Act of 1966 recognizes the importance of estuarine zones and their resources. Maryland, a State with many estuaries, all of which flow into a much larger estuary, the Chesapeake Bay, is deeply affected and interested in its management, development and protection, and of prime importance to its future environment in many ways.

A look at some of these problems will emphasize the need for proper management and controls as to erosion, siltation, affluent discharge from sewage treatment plants, seepage from septic tanks, surface crafts, both pleasure and commercial, which discharge oil, refuse and waste water, industrial wastes, agricultural wastes, and thermal pollution. These problems all affect the balance of nature, both animal and vegetable, in estuaries and estuarine zones. The preservation of wildlife on estuarine watersheds and aquatic life in estuaries are most important.

Belatedly, the nation has recognized that the estuarine zones have finite boundaries and that a combination of pollution and poor management practices have gradually eroded their value for many beneficial uses.

In an endeavor to correct these deteriorating situations, some legislation has been passed by Congress. Maryland's Legislature has been continually studying and legislating in these areas. However, the inter-state nature of the estuarine zones causes many of these problems that the State of Maryland alone can not solve. The legal questions present perplexing issued and the financial burden for this unique Chesapeake Bay estuary is tremendous. Just this past September, a two-day Governor's Conference was held at Wye Institute on the Chesapeake Bay, with many in attendance, for the purpose of bringing together the views of the State and Federal Governments, as well as private industry covering these very subjects.

At the State level, much more remains to be done, however, it is highly desirable that such a program be coordinated and correlated with uniform policies being essential to insure standarized approaches and solutions to the common problem of Maryland, its sister states, and nation.

With this in view I wholeheartedly endorse and offer any assistance that my office can give to further the comprehensive study as directed under the Clean Water Restoration Act of 1966.

Sincerely,

Francis B. Burch
Attorney General

C. EDWARD WALTER, P. E.
BUREAU HEAD

DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING
MUNICIPAL BUILDING
BALTIMORE, MARYLAND 21202

November 12, 1968

Mr. Eugene T. Jensen
Regional Director
Middle Atlantic Region
Federal Water Pollution and
Control Administration
918 Emmet Street
Charlottesville, Virginia, 22901

Dear Mr. Jensen:

The success of measures devised to control or improve the water quality in the Chesapeake Bay to meet the needs of all users will depend upon the cooperation of these users, and this in turn depends upon a program of inducing responsible people to become involved, and upon complete dissemination to them of all information associated with decisions on water quality requirements as soon as that information is available.

The City of Baltimore has immeasurable interests in the quality of the water in Chesapeake Bay and its tributaries and in actions designed to control this quality. These waters are necessary for shipping, for the dilution of effluent from its waste water treatment plants, and for the recreation of its citizens as well as a source of food supply. The waste treatment facilities of the City also serve major areas in Baltimore, Anne Arundel and Howard Counties. The City recognizes what it must do to prevent waste from harming the Bay or its tributaries. It is planning for the facilities necessary to protect the quality of the water in the Bay and it will see that these plans are completed and implemented. Interceptors and treatment plant improvement and expansion proposed in the City's six-year program will cost approximately 90 million dollars. This is exclusive of minor amounts for lateral sewers and for improvements to storm sewers designed to prevent the direct discharge of polluting materials.

The needs of the Bay and its tributaries are many and co-ordinated study and planning is needed to determine the magnitude and priority of importance of these needs and the means of assuring their protection. The effort will be successful only when the agencies, communities and others with a vested interest in the problems of the Bay, and with the knowledge and means for assisting in the program, are included in the deliberations or planning.

The Division of Waste Water in the Bureau of Engineering is responsible for the elimination of faulty sewerage conditions in the City, the control of waste discharges from properties in the City or owned by the City, and the operation of pumping and treatment facilities owned by the City. All matters pertaining to water quality, pollution control, and operation of treatment facilities should be directed to this Division or the Bureau, and they should be made familiar with any planning that will have an effect on any waters or sewerage facilities controlled by the City. The failure, even though accidental, to specifically notify us of the hearing on water quality is indicative of the lack of co-ordination that has been the pattern in Maryland planning for many years. Also indicative of this lack was the addenda to the State Water Standards, without knowledge of the City, establishing treatment with 85% BOD removal as a requirement for all facilities discharging into the water of Baltimore Harbor. The City only learned of this requirement when a request for a Federal Grant to aid in the expansion of its Patapsco Waste Water Treatment Plant was denied because it was not accompanied with a statement agreeing to the construction of secondary treatment facilities within the next few years.

As an individual and a professional engineer whose life has been devoted to encouraging the development of sanitary facilities and the elimination of pollution, I am concerned over the continued lack of co-ordination of our efforts to improve the waters of the State. There are a multitude of agencies and persons studying the Bay, planning facilities, and making planning decisions. Many of them are working in ignorance of what others are doing and some, I am certain, are giving approval for operations or developments that are in conflict with requirements being promoted by others. Some also jealously guard their operations and information that they obtain so that many who should have this knowledge do not know it is available. Much of the work, I am sure, is being duplicated and some is probably unnecessary and could be eliminated. Without a knowledgable, informed and forceful coordinating agency or group, results are not likely to be obtained until more damage has resulted to the Bay.

I urge that a group of trained persons representative of all legitimate interests in Bay waters be established to regulate and co-ordinate all studies, planning, proposals for pollution control measures and other proposals affecting the Bay. This group should also be responsible for seeing that the public, especially those to be affected are informed of any plans or actions that could be either harmful or beneficial to the uses of the Bay.

Very truly yours,

Wm. A. Hasfurther

William A. Hasfurther, P.E.
Chief, Division of Waste Water

WAH/n

CC: Mr. B. L. Werner
Mr. C. E. Walter

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"Serving the Potomac River Basin States"

CITIZENS COUNCIL FOR A CLEAN POTOMAC

5929 River Drive • Lorton, Virginia 22079
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4507 MacArthur Boulevard NW
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November 9, 1968

Mr. Eugene Jensen
Director, Middle Atlantic Region
Federal Water Pollution Control Administration
U. S. Department of the Interior
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Jensen:

Following the presentation of our statement before the FWPCA Regional Meeting in Annapolis on October 30 you requested this Council to submit recommendations which might be considered in connection with water quality standards. We believe that colloteral consideration must include what should be the important major objectives: abatement of pollution and the protection of the Potomac Estuary (and the Chesapeake Bay) and its water resources... the ecology, fish and wildlife and recreation... and declare and administer the area on a regional basis.

We greatly appreciate your compliment and have carefully considered the recommendations enuciated herewith.

During the questioning period we emphasized that regulation should and must be considered and established on a regional basis, and the Chesapeake Bay with its many tributaries including the Potomac Estuary surely is the logical region to be defined.

The Potomac River and Chesapeake Bay and their environs as a unit is the mother of a grand and varied ecology which is essential to the population survival throughout the Eastern United States; indeed the nation and mankind in his environment of today.

Mr. Eugene Jensen, continued -

Because any regulatory consideration is dependent upon the cooperation of the political subdivisions comprising the Basin Area it is essential that the leadership of those states enunciate on record with their agencies and the public that the Potomac Estuary and Chesapeake Bay and their tributaries shall not be used as a dumping ground.

Further some corporate entity is needed to coordinate the interests of the several federal agencies, and the interests of the states and local subdivisions. Only through such a mechanism can there be any administrative overview to insure the regional interest and responsibility for orderly and protective development. Such an agency might be known as the Chesapeake Bay Administration.

We therefore recommend the following as basic to the protection of the Estuarine Area and the environment along the Potomac River and the Chesapeake Bay (and their tributaries).

1. Formal recognition by the Federal Government, the States and the District of Columbia of the Estuarine zone as an essential national and state resource.

2. Establishment and recognition by the States of their right and obligation to review and modify local planning and zoning.

3. Creation by local subdivisions (county, city and town) of zoning commissions to plan for orderly development within the subdivision.

4. Development by States with Federal cooperation of a regional land use plan for the Estuarine Area which will provide guidelines for local planning, and interstate planning where desirable and necessary.

5. Institute a plan for easement such as now in limited use by the U.S. Department of the Interior as related to the Potomac National River Plan.

6. Identification and evaluation of marsh lands and provision for necessary protection.

7. Foster strong local programs with state and federal support designed to reduce erosion and sedimentation. (This is a particular and serious problem in the Potomac Estuary for nearly 2.5 million tons of sediment is transported annually from upstream reaches and the Washington area is where most of it settles out.)

Mr. Eugene Jensen, continued -

8. Establish and adhere to firm schedules and financial support for treatment plant construction and operation in the public and private sector to cause removal of the greatest amount of pollutants and protect the water quality including the characteristics of salinity, temperature, chemical balance, available oxygen and the like.

9. Establish criteria and provide supportive staff to measure against known conditions that effect the input of pollutants, the loss of wetlands, the addition of heated water, the spillage of oil and all other disastrous circumstances that affect the ecology of the Basin Area.

10. Establish an advisory council or commission with a membership broadly representative of the citizenry charged with an objective to highlight through education and public action the protection and conservation of natural resources and the enhancement of environmental living throughout the Area. Specifically an advisory council should aggressively challenge the regional constituency on preventing and correcting pollution problems, providing adequate water supply, imaginative preservation and development of recreation involving water and shoreline development for pleasant living, soil erosion control, advance the conservation interest and maintain the natural beauty.

For too long government and the private sector have failed to recognize the priceless asset of our watershed. We must now hasten to take all necessary steps to insure protection of our waterways and shorelines to cause the orderly development for varied uses and pleasure now and for the future. Only in this way can we be sure that the coming generations will be able to share a resource priceless and essential to mankind.

The growing megalopolis along the Atlantic Seaboard and especially the Baltimore-Washington-Hampton Roads Region demand that responsibile leadership in the public and private sector address itself forthrightly, with affirmative determination, decision and action, to this vital issue.

Sincerely yours,

William H. Waters

William H. Waters, Jr., Chairman
Potomac River Study Committee

P.S. Color prints of oil spillage will be forwarded to you upon our receipt of same from the Eastman Kodak Company, Rochester, New York.

SENATE OF MARYLAND
ANNAPOLIS, MARYLAND

PAUL J. BAILEY
STATE SENATOR
FIFTH SENATORIAL DISTRICT
CHARLES AND ST. MARY'S COUNTIES

ST. MARY'S COUNTY OFFICE ADDRESS:
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PHONE – GREENWOOD 5-9110

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BOX 516,
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RESIDENCE:
TRENT HALL FARM
BOX 230
MECHANICSVILLE, MARYLAND 20659
PHONE – TULIP 4-3603

October 29, 1968

Honorable Jess W. Malcolm
Executive Director of the Chesapeake Bay Foundation
Annapolis, Maryland

Dear Jess,

I am indeed saddened by my inability to be with you in Annapolis on October 30 and probably the 31st to attend the meeting relative to the Chesapeake Bay/ but, I would appreciate it if you would in your discretion pass my strong feelings on the the meeting.

I am sure you are aware that the legislative delegation of St. Mary's County and two members of our three member Board of County Commissioners have disapproved of the oil installation planned for this County. I am reliably informed that the sponsers of this project and others like them will continue their efforts to industroa;oze this area.

Based on the information given at the Governor's Conference at Wye, September 13, I am absolutely convinced that there is an immediate need for some sort of zoning of the entire Chesapeake Bay and its tributaries: and a powerful interstate authority which would have complete control of the shores involved - otherwise each County and many subdivisions have it is their power to eventually destroy the Bay. Certainly the practice of building great power plants factories, etc. and then applying for permits, must be stopped; and, as you know it is being done today.

Until something of this sort is done, statewide, inter-state, and perhaps Federal, we con look forward to nothing but such terrible conflicts as we have had in this County in recent months, and we are too ripe an apple and too unaware of the dangers which we face, to be able to ward off the tempting but ruinous industry constantly pressing upon this last stronghold of nature.

Remember that the Federal government in order to save the duck, geese, and swans had to take the situation over completely and the new generation coming along in this Country, seeing the ruin of so many waterways, is bound to demand that those of us in charge of the

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Honorable Jess Malcolm
Page 2
October 29, 1968

situation act immediately to save what is left.

I congratulate all of you for your efforts to save the Bay, and I pledge you my support.

Very Respectfully Yours,

Paul Bailey

Paul J. Bailey

PJB:djb

THE MAGNITUDE OF THE SPOIL DISPOSAL PROBLEM

R. B. Biggs
University of Maryland
Chesapeake Biological Laboratory
Solomons, Maryland 20688

PREPARED FOR FWPCA HEARINGS HELD IN
ANNAPOLIS, MD., OCT. 30, 1968

CBL Ref. No. 68-90

The Magnitude of the Spoil Disposal Problem

"Maryland must continue to hold its position in marine commerce in order to maintain its present sound economy. It must, at the same time, preserve and develop its fisheries and encourage developments along its shores. Inevitable, conflicts arise among various interest groups. Some feel they are damaged by the disposal of dredged material. Others, interested in shipping and boat operations, feel that channel dredging must be pursued aggressively at all costs. We believe that reasonable compromises must be developed and accepted, if all are to prosper." (excerpted from 1961 Annual Report, Maryland Board of Natural Resources, p. 152-153.)

In light of the position taken by the Maryland Board of Natural Resources, I would like to review the spoil disposal problem as it relates to Maryland and particularily to Baltimore Harbor and its approaches.

"Spoil" is that unused bottom material removed in dredging operations. My definition is not a scientific but a functional one. Thus, spoil may be gravel, sand, shell, stiff clay, soft mud or any other bottom material if these are disposed of by dumping them somewhere out of the way. If, on the other hand, the dredged material is used for a constructive purpose, then it may be defined as "fill". Gravel, sand, shell, and stiff clay have been used to create fast land. Dredged shells have been utilized to improve bottom conditions for the setting of oyster. Soft mud is the bottom material which is most difficult to utilize and most often is thought of as spoil.

In Baltimore Harbor and its approach channels, almost all of the material removed in maintenance dredging is disposed of as spoil, and most of the material removed in "new work" is spoil. During 1969 and 1970, there is need to dispose of 8.4 million cubic yards of spoil (this estimate includes the new Baltimore Harbor Tunnel, maintenance, and private work for these two years). If the Baltimore channel is deepened from the present 42 foot depth to 45 feet, then 22.5 million cubic yards of material will be removed. (The proposed 45 foot channel is now being studied by the Corps of Engineers.) The Maryland Port Authority estimates that a 50 foot channel may be a reality in 10-20 years. This would generate an additional 26.3 million cubic yards of material. In addition, about 2.3 million cubic yards are dredged in maintenance and small projects each year. The total amount of material to be removed from Baltimore Harbor and its approach channels, during the 20 year period 1969-1989, amounts to about 99 million cubic yards! Under present circumstances most of this material would be defined as spoil.

It is instructive to examine the possible uses which could be made of this material. Are there any positive benefits to be derived by the State of Maryland or should this material be dumped in the most convenient spot?

In order to utilize this soft mud for creating "fast" land suitable for light industry, it is necessary to do one of two things; wait 20 years for the material to become de-watered (e.g., Harbor Field in the Inner Harbor); or utilize plasticizers to "cement" the material. Most industries located on the Patapsco River do not want to wait 20 years to build on land created in front of their property. The use of plasticizers costs about $600,000 per acre (12 feet deep) to stabilize this soft mud. The cost is considerably more than the current value of harbor waterfront. I conclude that limited use of this soft mud for "fill" will not reduce the problem significantly.

How then can spoil material be handled? Perhaps we should find a good "spot" in which to dump it, although some complicating factors enter the picture when we look for a good "spot".

Due to 50 years of industrial pollution, the top layer of mud in Baltimore Harbor contains high concentrations of "heavy metals" (cadmium, zinc, copper, chromium, lead, mercury, nickel, etc.). Some of these metals have been shown to be toxic to aquatic life. Others, though not in concentrations sufficient to kill marine organisms, are accumulated in these organisms, and may produce illness or death if consumed. The effect on marine organisms of spoil which contains high concentrations of heavy metals is not available or readily developed.

Waterfront property owners object to overboard disposal, and claim that debris and mud on their beaches damage property values.

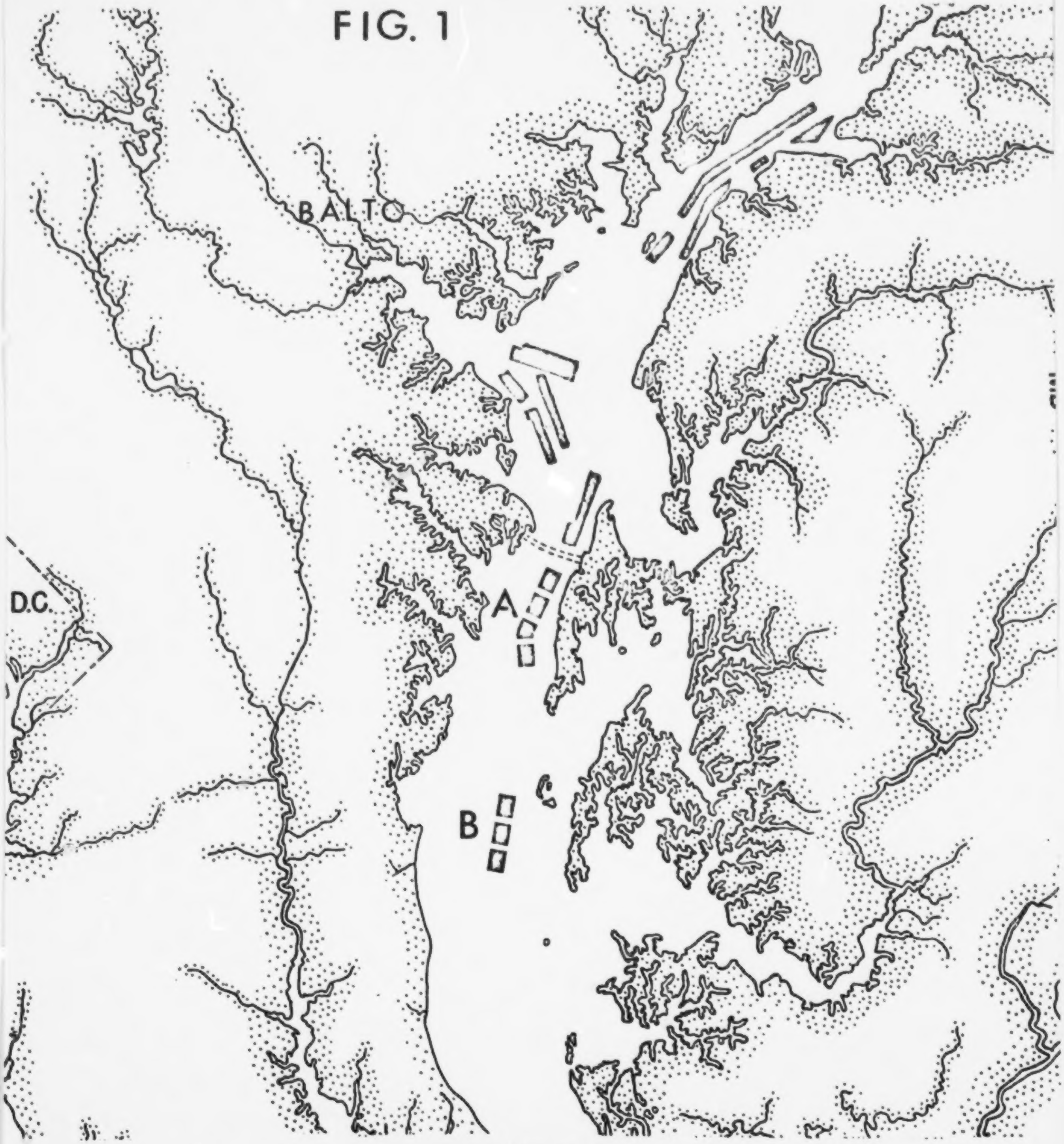
Studies on overboard spoil disposal in the upper bay revealed that turbid water extended 2-3 miles up-current from an hydraulic dredging and discharge operation. The spoil material dumped on the bottom "flowed" over an area 5 times the area of the authorized disposal site. Evidence which we have developed indicates that some of the spoil deposited in shallow water (less then 10 feet deep) has been resuspended by waves and currents and has been "lost".

We now can state fairly the conditions necessary for the right "spot" to dump the spoil. The "spot" must be away from shore (thus protecting the property owners), it must be in quiet water (thus reducing resuspension), it must be a basin (so the material will not "flow"), and it must be away from commercial shellfish harvesting areas (to prevent physical smothering and/or heavy metal contamination). The other consideration for the right "spot" is proximity to the area to be dredged so that the cost of transporting the spoil would not prohibit the project. Those areas which meet most or all of these conditions are restricted to the deep channel of the bay.

The areas of upper Chesapeake Bay which have been utilized for spoil dispssal are illustrated in Figure 1. These areas are, for the most part, shallow water disposal sites. Two notable exceptions are the Kent Island "Dumping Grounds" and the Pooles Island disposal area. These two areas are located in deep water troughs.

By planimetric measurements of areas which have been or are now active disposal sites, I have calculated that about 10% of the bay bottom north of the Land Memorial Bridge is designated as a spoil area (these estimates are for the bay proper, point to point across river mouths). We have no way of knowing the total area buried by unconfined disposal (in the upper bay, study that we completed the area buried was 5 times the designated disposal area).

FIG. 1


BALTO
D.C.
A
B

A proposed by Corps

B proposed by *ad hoc* committee

▭ existing disposal area

0 5 10 15 20 25
miles

The problem of spoil disposal at the present time is the result of a "crisis" which need never have occurred. The Corps of Engineers and the Maryland Port Authority provided estimates of the quantity of material to be spoiled, so that, in 1961, the Maryland Commission on Submerged Public Land wrote:

> "Dredged materials should continue to be deposited in deep waters in recommended locations, when it is impractical to place the materials in designated shallow waters on shore. At the earliest possible date, adequate studies of the effects of deep water disposal in recommended areas should be initiated so that basic factual data will be available for evaluation of the effect of disposal on the fisheries and adjacent shore areas before the areas are actually used for this purpose. Presently designated deep water disposal sites appear adequate for the deposit of the contemplated dredged material until about 1965. This Commission urgently recommends that the above described studies be completed prior to the time when new disposal areas or techniques will be required." (p. 158, Annual Report, Maryland Board of Natural Resources, 1961).

The Commission projected the filling of the Kent Island Disposal Area for 1965. Due to an enlargement of the area and a slight overestimate in the annual production of spoil, the Kent Island Disposal Area will not be filled until sometime during 1969. However, the studies of the effect of deep water disposal on "fisheries and adjacent shore areas" have not been initiated, so that the State of Maryland is in the same position as during 1961, namely, with a lack of basic factual data on the effects of deep water disposal, and the requirement to define a new disposal area.

The Maryland Port Authority estimated that the Kent Island Disposal Area will be filled sometime during 1969. The Corps of Engineers requested approval of a new deep water disposal area just south of the Lane Bridge. The Maryland Port Authority requested the formation of an *ad hoc* committee to answer the question, "What will be the effects of deep water spoil disposal on the area adjacent to the proposed southern extension of the Kent Island Dumping Area?" The *ad hoc* committee reported that a one mile "safety zone" should surround any deep water disposal area. The spoil should be deposited in a basin, but in such a manner that disposal occurs at least one mile from any productive shellfish area. The *ad hoc* committee recommended an alternate disposal area in deep water near Tilghman Island. The Maryland Port Authority estimated that dumping in the Tilghman area would cost about 40¢ per yard more than dumping in the area proposed by the Corps. This added cost will be involved in all bucket and scow dredging due to the increased travel time to and from the dumping area. Assuming that all new work was performed by bucket and scow, then the added cost, *at today's prices*, for dumping in the Tilghman area, would amount to 21.1 million dollars. This estimate would include the 2nd harbor tunnel, the channel to 50 feet and an estimate of private "new" work.

The parties involved in the spoil disposal program in Maryland are becoming polarized to one of two points of view. The Corps and Port Authority feel that additional expense (like that which would be incurred in going all the way to Tilghman Island to dump) will increase the cost-benefit ratio, jeopardize the funding of projects and prevent the orderly development of the Port of Baltimore in competition with other U. S. ports. State conservation agencies, lacking "basic factual data ... on ... the effects of disposal" are fearful because approval of the Corps request could destroy valuable shellfish and finfish resources.

The position taken by the Corps and Maryland Port Authority is defendable.

The position taken by State conservation agencies is defendable.

The Kent Island Disposal Area is filling up and will be filled during 1969.

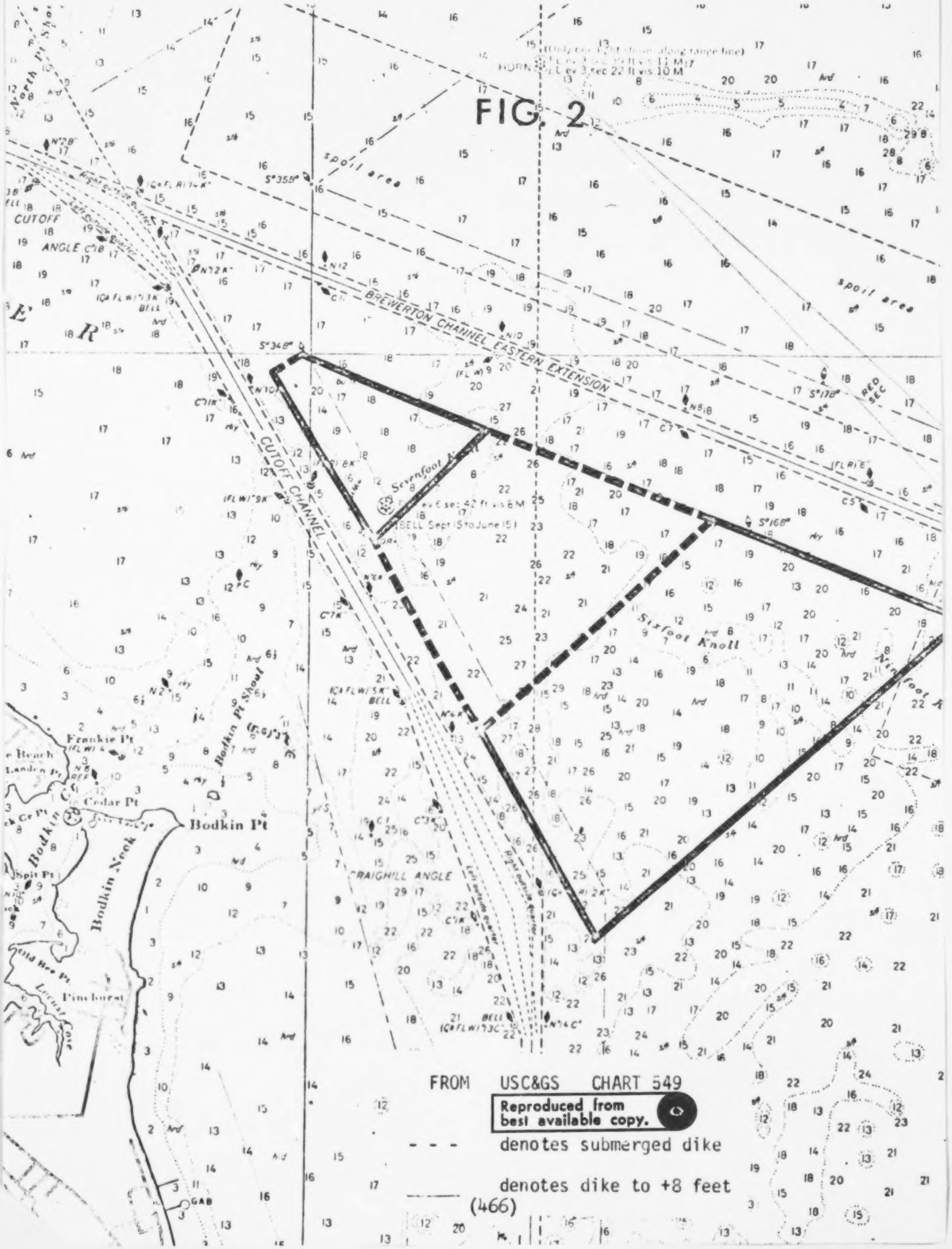
An alternative to either of the proposed disposal areas has been formulated.

My proposal is not new, nor is it original. The Commission on Submerged Lands (1961 Annual Report, Bd. of Natural Resources) stated, "Disposal on land, though impractical in some situations, is probably the best way to handle dredged materials."

Fig. 2 illustrates the area known as "Seven Foot Knoll," lying between the Brewerton Channel and the Craighill Channel to Baltimore. The area proposed as a disposal area is outlined on Fig. 2.

In order to understand how the "Seven Foot Knoll" disposal area could be utilized, it is necessary to review the methods of dredging. In the Baltimore area, hydraulic pipeline and bucket and scow methods are used almost exclusively

FIG. 2



spoil area
spoil area
CUTOFF ANGLE
BREWERTON CHANNEL EASTERN EXTENSION
CUTOFF CHANNEL
Sevenfoot Knoll
Sixfoot Knoll
Bodkin Pt Shoal
Frankie Pt
Cedar Pt
Bodkin Pt
Bodkin Neck
CRAIGHILL ANGLE
Pinehurst
HORN

FROM USC&GS CHART 549

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- - - denotes submerged dike

—— denotes dike to +8 feet

for dredging. In the hydraulic pipeline method, the material is sucked up by a cutter head and pumped through a pipe to a disposal area. The basic restriction on the method, insofar as disposal is concerned, is that the disposal area has to be within 2 miles of the dredge. To pump the spoil to distances greater than 2 miles requires the use of "booster" pumps and progressive increase in cost. The bucket and scow method involves the use of a clamshell bucket with the spoil placed in barges and towed to the disposal area. The restriction of this method, insofar as disposal is concerned, is that the loaded mud scows have a draft of 14 feet, thus restricting disposal to areas with depths greater than 14 feet. Hopper dredging has not been used extensively in the Baltimore area. Hopper dredges (essentially suction dredges with tanks to store the spoil, instead of pipelines to disposal area) are operated by the Corps and assigned to individual harbors. Baltimore does not have a hopper dredge.

Suppose that the following sequence were observed in spoil disposal at the "Seven Foot Knoll" site. A "dike" would be constructed around the total perimeter of the proposed disposal area and across the area to divide it into three sections. Parts of the dike would be submerged and parts would be above sea level, as illustrated in Fig. 2. The submerged dike would come to an elevation of -14 feet, just deep enough to allow the passage of a mud scow. This dike could be constructed of oyster shells which are available in large quantities in the immediate area. Every effort should be made to obtain the shell from within the disposal area. The dike would prevent flowing of the spoil dumped inside the disposal area. The approximate volume obtained by diking to -14 feet is as follows: Area I, 1.4 million cubic yards, Area II, 12.4 million cubic yards, Area III, 9.5 million cubic yards, total volume, 23.3 million cubic yards. Suppose that Area I is filled to -14 feet first, then all of the dikes around Area I would be heightened to +8 feet, and spoil could be pumped into Area I by any suction dredges operating within 2 miles. As each of the three sub-areas were filled to -14 feet, then the submerged portion of the dikes would be heightened to +8 feet and the outside protected with riprap. Assuming the areas could be filled to +6 feet, the volume of material which could be contained (from -14 feet to +6 feet) amount to 10.0 million cubic yards for Area I, 30 million cubic yards for Area II, and 45.7 million cubic yards for Area III. The total volume which could be handled in the "Seven Foot Knoll Disposal Island" amounts to about 23.3 million cubic yards below -14 feet, and 85.7 million cubic yards from -14 feet to +6 feet, for a total volume of 109.0 million cubic yards.

After bucket and scow deposition of 23 million cubic yards, there will obviously have to be rehandling techniques used to realize the capacity of the "island." Rehandling techniques involve considerable expense.

Economic consideration of the proposed "island" have not been worked out. I have neither the competence nor the desire to estimate the economic ramifications of the "island."

Because of the "island," new work dredging to 45 feet and to 50 feet will be possible with suction dredge and pipeline within about 2 miles of the island. This covers all of the Brewerton and almost all of the Craighill Channels as well as about 1 mile into the Patapsco River. Addition of booster pumps can increase the coverage available to suction dredging. The added cost of barging to the Tilgham area over the area immediately south of the bridge has been estimated at 21.1 million dollars. How much can be saved in travel cost for bucket and scow dredging if the disposal area (Seven Foot Knoll) is only one-half as far from Baltimore as is the area proposed by the Corps? Can the State of Marland share in the cost of constructing the dikes? Is there enough shell available near the "island" to construct the dikes? Can the costs be justified? (Norfolk dumps spoil in the Craney Island Disposal Island.)

Maryland has ignored the problem of spoil disposal since 1961, how much longer can it be ignored?

APPENDICES

APPENDIX A

June 17, 1968

Mr. Rodney Resta
Executive Secretary
Susquehanna River Basin Study
Coordinating Committee
Corps of Engineers
Federal Office Building
Baltimore, Maryland 21201

Dear Mr. Resta:

In accordance with your request at the last Susquehanna Coordinating Committee meeting, we suggest for your consideration the following objectives for land and water resources development in the Maryland portion of the Susquehanna Basin.

Maryland is most concerned with ensuring that an ample supply of water remains available for domestic usage in Cecil, Harford and the Baltimore metropolitan area and that the fresh water input to the Chesapeake Bay is not diminished in quantity and periodicity from that judged to be in the interest of the ecological well-being of the Chesapeake Bay system.

We again call your attention to the October 6, 1966 letter (Re: Eleventh Meeting - Susquehanna River Basin Study Coordinating Committee) from Richard J. Kretzschmer, Baltimore Bureau of Water Supply, to Colonel Frank W. Rhea outlining the projected water supply needs of the Baltimore metropolitan area. In addition, we call your attention to the testimony of Mr. Kretzschmer and the County Commissioners of Harford County in April 1967 on the Northeastern United States Water Supply Study. Copies of these presentations are enclosed. Other water supply needs in Cecil County are relatively small and could be met from existing sources - principally the Susquehanna River below Conowingo Dam.

At times of maximum withdrawal of water from the Conowingo Pool in the summer of 1966, the Baltimore City Bureau of Water Supply encountered increased water hardness requiring additional treatment. The increase in hardness is presumably attributable to acid-mine drainage upstream. We endorse the environmental quality objective of acid-mine drainage control.

The water Quality Standards adopted and approved for the State designate the waters of the Susquehanna River and its tributaries for water contact recreation, propagation of fish, other aquatic life and wildlife, agricultural water supply, and industrial water supply. In addition, the Susquehanna River, Deer, Broad, Conowingo, and Octoraro Creeks and tributaries are designated as suitable for public or municipal water supply. Ph values for all the above

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waters must not be less than 6.0 nor greater than 8.5. These water quality objectives should be supported by the recommended program of the Coordinating Committee.

A principal objective of development in the Maryland portion of the Basin is environmental quality with the emphasis upon water contact recreation, fishing and boating. The Conowingo Pool is the dominant feature of the area and the Philadelphia Electric Company will be emphasizing the continued development of recreational opportunity, both above and below the dam.

The State has by its actions established the Susquehanna Basin portion of Maryland as a principal recreational area. There are now three State parks - Deer Creek, Palmer and Susquehanna - with a present acreage of approximately 1,500.

In addition, Deer, Conowingo and Octoraro Creeks and tributaries are designated by the State as trout waters. Proposed small watershed impoundments, beneficial from a recreational standpoint, should also be compatible with maintaining and enhancing the recreational fishing opportunity for which the streams have been designated. Proposed projects 1-2, 1-5A, 01-4, and 1-6 should be carefully weighed in this regard to ensure low flow releases of cool water during the summer months. Furthermore, 1-5A on Deer Creek has potential for a bass fishery and is located upstream from the section of Deer Creek valued as a trout fishery.

The report "Summary - Watershed Needs Inventory, December 12, 1967" developed by the Maryland Soil Conservation Service shows needs for Deer Creek, but not Conowingo Creek.

We have inventoried the natural and unique areas of the State and find that the Upper Octoraro Creek Valley NW of Rising Sun should not be altered in any way. The same would apply for Deer Creek N of Bel Air and extending from Rocks State Park to U. S. Route 1 (approximately 6 miles).

It has come to our attention that the effect of present deepening of the C & D Canal would bring a significant increase in outflow of water from the Upper Chesapeake Bay into the Delaware Estuary. Such a situation could disrupt the fresh water flow regimen between the Susquehanna River and the Bay and would have to be considered a diversion similar to any upstream diversion. This could conflict with one of our principal objectives - protecting the present ecology of the Chesapeake Bay system until such time as controlled management can be established.

At the present time it is our understanding that the existing 27' C & D Canal channel allows for a net flow eastward of 1600 cfs and with present deepening to 35' this would increase to 3000 cfs. The net flow would also be fairly constant from day to day. The increase in net outflow would be slightly less than 100%. To put into perspective the potential impact

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of such outflows, we enclose Dr. D. W. Pritchard's paper, " Preliminary Estimate of the Effect of Diversion of Flow from the Susquehanna River on the Salinity of the Upper Chesapeake Bay." We do recognize that there is not a straight forward interrelationship between salinity levels and fresh water inflow in the Upper Bay. However, the absolute magnitude of the new outflows through the Canal causes us to raise this problem at the present time.

It is our intention to submit to review the flow regimen suggested by the Tentative Coordinating Committee Plan. While we are not commenting on the flows desired at this time, we will be guided by the comments of our Departments of Chesapeake Bay Affairs, Game and Inland Fish, and Water Resources, the Chesapeake Bay Institute, Natural Resources Institute, and the Baltimore City Bureau of Water Supply.

We trust this information will assist you and the Plan Formulation Work Group in developing the Tentative Coordinating Committee Plan.

Sincerely,

James J. O'Donnell
Director

JJO'D:RMA:sl
Enc.

cc: Spencer [illegible]. Ellis, Director
Department of Forests and Parks

Joseph [illegible]. Manning, Director
Department of Chesapeake Bay Affairs

George [illegible]. Shields, Director
Department of Game and Inland Fish

Paul [illegible]. McKee, Director
Department of Water Resources

R. J. Kretzschmar
Chief of Water Division
Bureau of Engineering
Baltimore Bureau of Water Supply

David [illegible]. Racine, President
Board of County Commissioners,
Cecil County

G. Howlett Cobourn, Chairman
Board of County Commissioners,
Harford County

Dr. L. Eugene Cronin
Natural Resources Institute

Dr. Donald Pritchard
Chesapeake Bay Institute

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b.c. Albert Miller
Roy Metzgar

DEVELOPING AND MANAGING ESTUARIES

A Statement of Policy and Guidelines for Effective Actions

The most useful aquatic areas in the world are in serious danger of destruction. The estuaries, where fresh water, land and sea meet in a dynamic and productive zone, are gravely threatened through unwise and unplanned excessive use of their valuable capacities. Specific problems in estuaries vary almost infinitely, but guideline policies are pertinent to most of the management problems involved. This statement presents such suggestions related to policies.

Estuaries include the coastal zone which is affected by both the run-off of fresh water from land and the salt water from the sea. This zone includes tidal rivers, marshes, bays and river mouths, the inshore edge of the ocean, and the land areas which interact with these. Policies for use of these areas should be based upon the natural resources contained in this great coastal zone and upon the complex human uses made of the zone.

The value of estuaries is well established - but appreciated by only a tiny group. It is not appropriate to provide here detailed statistical summaries, but the intense uses being made of coastal waters must be noted because they are so expansive, so competitive and potentially so destructive. All shipping for industrial or military purposes begins and ends in estuaries. The wastes of the great coastal industries and of a third of the people in this country are poured into these waters. About three-fourths of the fish and shellfish needed for food production and recreational fishing are totally dependent upon finding suitable conditions in estuaries. The coasts are in exploding demand for aesthetic and recreational use.

Each of these is an important human use - but shipping requires dredging and spoil disposal and too often produces destructive oil slicks or spilled toxic cargo. Treated sewage ruins healthy water by over-enrichment, and poisonous industrial wastes are still increasing. Even aesthetic use, which almost sounds above reproach, irretrievably destroys the ecosystem when vast areas are dredged or filled for housing - so that part of the reason for moving to the shore no longer exists. All of these uses, and others, have developed without comprehension of their effects and interactions and without plans for an optimal balance for present or future human uses. Present and potential uses involve vast and complicated economic problems, political and geographic difficulties, grave social questions and frightening legal complications. Nevertheless, they must be resolved, since the uses and abuses of estuaries are now unmanaged, irrational, and often absolutely incompatible.

The estuaries are complex. A marvelous and productive ecosystem has emerged slowly over thousands of years. The river, the land and the sea all make essential contributions. Biologically, the estuarine zone contains a unique mixture of species which produce very large crops. Some species are permanent residents, taking full advantage of the capacity of the estuary to trap nutrients. Others use the estuary as the oceans' greatest nursery or as a grazing area. The estuarine ecosystem is not yet fully comprehended, but enough is known to show that the entire system can be easily damaged or permanently destroyed if detrimental changes occur in the river, on nearby land or marsh, in the coastal ocean or in the estuary itself. It is extremely easy to destroy quickly resources which cannot be renewed as rapidly - or to destroy permanently and irreversibly an essential link in the estuarine ecosystem.

As guidelines to effective management of these areas, the following specific proposals are made:

1. The objectives of estuarine management must be identified and agreed upon.
2. An adequate inventory must be made of the estuaries and of their present and potential human uses.
3. Research must be intensified to provide the bases for rational decisions.
4. Controls must be established over the alterations which are occurring and those which will be proposed.

5. Immediate action should be carried out at all levels of government toward improved management.

All of these are urgent requirements and very difficult tasks. Many points of view must be expressed and reconciled, and the Atlantic States Marine Fisheries Commission suggests that the following comments may provide some initial stimuli:

In selecting objectives:

a. Multiple usage exists and will be intensified. A rational balance among such uses will be required.

b. Long-term objectives must take clear precedence over short-term gains. This is especially critical when a short-period use would destroy an essential link in the ecosystem.

c. The objectives must be consistent with the basic principles of biology, chemistry, physics, economics and government or they are doomed to failure.

d. Objectives will inevitably vary from place to place and from time to time. General objectives must, however, be sought for large coastal areas and specific objectives must be clarified for each watershed system.

On taking inventory:

a. In general terms, our estuaries have never been properly described. Good management will require thorough description of these areas and resources, careful analyses of all of their present uses and projection of the best possible estimates of future uses.

b. Inventory must also include measurements of present and potential damage and losses, based upon reasonable measurement and prediction.

c. Valuable leadership has been given by such states as Massachusetts, New York, Delaware and others, by the federal-state efforts toward an estuarine inventory along the Gulf of Mexico, by the wetlands surveys of the Bureau of Sport Fisheries and Wildlife, by the new program of the Marine Resources Committee of the Belle W. Baruch Foundation and by other agencies and individuals. These now provide useful assistance, but will not alone be adequate.

d. Inventories must be carried through to estimates in terms of measurable economic value.

e. Adequate and standardized methods for inventory are generally lacking. They are urgently needed and should be developed at the earliest possible moment.

f. Statistical systems for recording and analyzing the many uses of estuaries are insufficient. They must be improved and more widely utilized.

On research:

a. Although present levels of research in estuaries are impressive, the emphasis is very recent. Knowledge is far from sufficient to provide the specific details and broad principles which must be available for optimal management.

b. Research should be carried out at all pertinent levels of basic science and of applied science. The upper limit should be set only by the availability of competent scientists. Research should be supported at colleges and universities, in private industry, at state and federal laboratories, and wherever else competence may appear.

c. Biological research is especially needed on the life history and requirements of useful species, on the causes of natural and man-induced fluctuations in abundance, on the biological effects of various modifications in the coastal environment, and on the flow of energy into and through the various estuarine ecosystems,

On control.

a. Jurisdictional responsibilities must be clarified. These will be very difficult indeed, since they involve private owners, towns, counties, states, the national government and occasionally international groups. These often involve traditional and jealously guarded patterns. It is also true that ownership often differs from jurisdiction for management (by health controls, fishing regulation, pollution laws, etc.). Without clarification of jurisdiction, however, optimal management can never be acheived.

b. Traditional responsibilities of the states and of the federal government are central to effective controls and merit urgent attention and clarification.

c. Controls cannot be adequately designed or effectuated without prior selection of objectives, inventory and research,

d. In view of the present rapid degradation of our coastal areas, interim controls are imperative. These must be conservative. We suggest that controls must be most conservative where knowledge of effects of change is weakest.

e. Zoning of specific locations and areas of estuaries appears to be an essential tool for management. There is substantial danger, however, that zoning may be carried out with insufficient regard for the essential unity of the estuarine system and without proper attention to the distant effects of local uses.

On action.

a. At the LOCAL level, we urge

(1) public education on estuaries.

(2) analysis of legal problems in management.

(3) specific conservative controls when pertinent.

(4) acquisition of title or the development rights of border lands and waterways in the public interest.

(5) zoning of coastal areas, based on a conservative approach and implemented by strong regulation.

b. at the STATE level, we urge

(1) public education on estuaries.

(2) formal and definitive analysis of legal problems, with development of specific corrective legislation.

(3) firm and conservative interim control of the uses of the estuary, especially for

- (a) domestic and industrial waste disposal.
- (b) dredging and spoil disposal.
- (c) destruction of wetlands.

(4) thorough inventory of present and future values and losses, in close cooperation with other agencies.

(5) thorough monitoring or present water and land quality and of changes occurring in that quality.

(6) rapid acquisition of appropriate estuarine areas.

(7) fresh and comprehensive development of objectives, policies, plans and practices

for the optimal management of estuarine areas.

(8) support and encouragement of research on the estuary, to permit protection of present values, prevention of destruction, and positive achievement of the optimal values of these areas.

(9) effective coordination of the many government agencies involved in estuarine use and management.

c. At the INTERSTATE level, we urge

(1) support of public education on estuaries. For the Atlantic State Marine Fisheries Commission, this will include preparation of a leaflet of excellent quality on the nature, values and optimal uses of estuaries. This could be widely distributed to public officials for present guidance and to schools for education toward the future.

(2) vigorous support of state and federal efforts toward development of objectives, inventory, research and control.

(3) further expression of a strong and persuasive statement of policy on estuaries.

(4) development of suggested legislation on estuarine development and management.

(5) improvement of mechanisms for dealing with situations, where two or more states are involved in estuarine problems.

(6) interstate planning for protection and enhancement, as is being accomplished by several river basin commissions.

d. At the FEDERAL level, we urge

(1) public education on estuaries.

(2) efficient coordination among the several departments and multiple agencies which are involved in estuarine responsibilities.

(3) appropriate research by federal agencies and support of research by other competent agencies and individuals.

(4) special leadership in development of methods for inventorying estuaries, evaluating the uses of estuaries and expression of federal policies.

(5) continued acquisition of appropriate areas, through federal or cooperative federal-state programs.

Adopted by the Atlantic States Marine Fisheries Commission, October 7, 1966 at Portland, Manne

Ronald W. Green, Chairman

Recommended by the Biological Committee of the Commission

Dana Wallace &
David H. Wallace, Co-Chairmen

Prepared by the Estuarine Committee

L. Eugene Cronin, Chairman
Robert Dow
Robert Hutton
G. Robert Lunz
Eugene P. Odum
John Poole
Roland Smith
Albert Swartz
Frederick Wilbour

C-1 APPENDIX C

Management Tools
for the
Susquehanna River - Chesapeake Bay System

The Susquehanna River system and the Chesapeake Bay are parts of the same hydrologic unit. The river provides 80% or more of the fresh water entering the Bay above the Potomac Estuary, or approximately one-half of the total fresh water entering the Bay from all sources. In terms of quantity, the river contributes an annual average of 25 billion gallons per day of fresh water to the Bay.

It is possible that through undesirable changes in the quality or quantity of fresh water entering the Chesapeake Bay irreparable harm may be done to its resource values and potential. To a limited extent, the same danger exists from major physical changes that might be made in the configuration of the Bay through filling, dredging, and spoil deposition.

It is estimated that the retail value of the commericial fishery of the Bay is approximately $40 million annually and provides a livelihood for 20,000 or more persons. In 1965, waterborne commerce totalling 150 million tons moved over the waterway.

The population of the region surrounding the Bay is growing, with the bulk of this increase in the Washington and Baltimore metropolitan areas. Recreational demand (water contact sports, boating, fishing, and sightseeing) will most likely increase commensurate with the increase in population, provided a suitable environment exists to foster this anticipated increase in activity.

Furthermore, industrial growth in the Baltimore Metropolitan area will, in part, be dependent on the availability of suitable brackish water as fresh water sources become more limited and costly.

The Chesapeake Bay is a natural resource of many faceted importance. It is the nation's largest estuary. Within Maryland, the length of the Bay's tidal shoreline (including the tidewater portions of tributary streams) is approximately 4,400 miles and represents a surface area of approximately 2,300 square miles (1,472,000 acres). From this significant natural resource, a multiplicity of social and economic benefits can be developed and maintained on a sustained basis, provided the necessary management and analytical tools are available and programs underway. *

In 1961, Congress authorized the U. S. Army Corps of Engineers to initiate a comprehensive study of the Susquehanna River Basin. The study will recommend a series of alternative plans designed to provide for the economic development of the Basin area and water-related uses and activities. The plan will insure that water quantity and quality will not become limiting factors in the development of the Basin. Plan formulation was begun in late 1966 and will be carried out through 1967, with plan review in 1967 and 1968. Finalization and submission are now anticipated for 1969.

Proposed development in the upstream portions of the Basin can not have meaning in the context of comprehensive planning for the Susquehanna River Basin-Chesapeake Bay system unless the potential downstream effects upon the Bay can be effectively analyzed. ** The technical capacity for simulating and predicting the downstream effects of future water resources development must be available if a rational and truly comprehensive approach to river basin development is to be realized for the Susquehanna Basin. *

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* See Attachment I - Statement adopted by the Atlantic States Marine Fisheries Commission on "Developing and Managing Estuaries."

** In the Report of the Environmental Pollution Panel of the President's Science Advisory Committee (October 1965) entitled Restoring the Quality of Our Environment, the following statement was made: We recommend that interstate and Federal-state river basin development compacts and agreements cover related estuaries and marshes. Many marshes and estuaries lie at the mouths of large river systems or are measurably influenced by the effluents from such systems. Prevention of pollution and other destructive changes in these water bodies should be one of the most important elements in Federal-state river basin development. Although their importance as breeding grounds for fish and shellfish is less obvious, similar considerations apply to the shallow inshore waters of the Great Lakes.

The management and analytical tools required for this continuing function are both a physical model of a suitable portion of the Susquehanna River - Chesapeake Bay system and mathematical models. Expeditious implementation and coordination of several Congressionally authorized activities, including: 1.) the U. S. Army Corps of Engineers' hydraulic model study of the Chesapeake Bay (P.L. 89-298 "Sec. 312"), 2.) the Department of the Interior's mathematical model simulation of water quality factors of the Potomac and other estuaries and Chesapeake Bay - Susquehanna River Basins Project in general, and 3.) the mathematical model simulating the Susquehanna River Basin water flow characteristics to be developed as a component element of the on-going Susquehanna comprehensive study will contribute to the development of an analytical capability useful in the management of the Susquehanna River - Chesapeake Bay system. The application of systems analysis techniques to Chesapeake Bay data collation and evaluation may also be of high value in the development of management and analytical tools and programs.

Much attention has been given to the uses and potential of mathematical models in water resources management. As indicated, the Federal Water Pollution Control Administration, through its Chesapeake Bay - Susquehanna River Basins Project, is developing such models for limited portions of the Potomac and Patuxent River estuaries. However, the desirability and timeliness of developing a hydraulic model for a suitable portion of the Susquehanna River - Chesapeake Bay system, while recognized in law, has not been sufficiently appreciated by some .

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* See Attachments II and III - Papers delivered by Dr. L. Eugene Cronin and Dr. Donald Pritchard at the 11th Coordinating Committee Meeting of the Susquehanna River Basin Study held October 4, 1966, in Elmira, New York.

Both the hydraulic and mathematical models have complementary and competitive features. However, the complementary features are of significant importance, while the competitive features do not preclude the desirability of both simulation approaches. A key feature of both simulation models is that they allow for greatly shortening the natural span of time for analytical purposes.

The mathematical model is of very critical value in the programming and analysis of multi-variable situations such as the Susquehanna flow - Chesapeake Bay water quality - biological and ecological relationships. To program and analyze such a complex set of factors, both data and information relating to existing physical (water quality) and ecological interrelationships must be at hand. The mathematical model program is only as good as the data available and the level of understanding of factor relationships. It is at this juncture that the hydraulic model can serve a very vital role.

Through simulation of various fresh water flows, some wind characteristics, natural surface characteristics of the Bay, shoreline configuration, water temperature, salinity, and tidal movements, the circulation patterns of the Bay's waters and salinity distribution can be studied. This physical modeling procedure would enable the water resource manager and researcher to identify, obtain, and help verify water quality characteristics, water flow, and mixing patterns in the Chesapeake Bay for a variety of conditions through manipulation of the simulated characteristics stated previously. Data and information obtained in this manner would constitute a valuable input into the mathematical model program.

Data secured in this manner is in large measure unobtainable otherwise through field studies. The obvious reason for this is that while natural characteristics of the Bay do change from day to day (and thus a wide range of variable situations does exist over time), it is impractical and financially and humanly unreasonable to attempt to measure such changes in the field.

While verification of the hydraulic model will require field studies of a limited nature, the substantial economies of time, manpower, and financial resources realized through use of the model should be apparent.

Apart from the hydraulic model's relationship to the mathematical model, it has several important separable merits. These are briefly enumerated:

1. Providing a visable analytical device for educating the resource manager as well as the general public.
2. Controlling the simulated variable conditions for what ever length of time is desired.
3. Determining the fate of sediment deposited in various parts of the Bay.
4. Determining the downstream penetration of potentially harmful chemicals introduced into various parts of the Bay system.
5. Evaluating the capacity of the Bay for receiving pesticides and insecticides.

Additionally, both modeling procedures require verification for predictive and analytical accuracy. In the verification process, each model would complement the other.

The foregoing comments, in part, relate to the Susquehanna River Basin Comprehensive Study and current on-going plan formulation activities. The statement emphasizes and supports the need for flexibility, open-endedness, and recognition of the important role to be played by a permanent Susquehanna Compact river basin management organization in the administration of its responsibilities within the context of the developing Corps of Engineers' Susquehanna River Basin plan. In this framework, a vital consideration in the comprehensive management and administrative overview of the Susquehanna River - Chesapeake Bay system is the need for analytical tools to assist in evaluating the effects on the resource characteristics of the Bay resulting from inter-basin diversions and upstream water resources development.

The public interest obligates the Federal and State governments to expedite the effective establishment of such management and analytical tools. If the national policy regarding our interstate and navigable waters as expressed in existing Federal statute - i. e.:

1. the Flood Control Act of 1944,
2. the Water Resources Planning Act of 1965,
3. the Water Pollution Control Acts of 1965 and 1966,
4. the Rivers and Harbors Act of 1965* and 1966,
5. P.L. 89-720 (H.11475) Jellyfish - Elimination, and legislation considered by the Congress, such as S. 2262 and H. 1111 concerning ecological research and surveys

are representative of action in the public interest, it is altogether reasonable to expect the Administration and Congress to lend full support and encouragement to such an effort.

Maryland State Planning Department
January 1967

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* See Attachments IV and V.

A Preliminary Estimate of the Effect of Division of Flow from the Susquehanna River on the Salinity of the Upper Chesapeake Bay

D. W. Pritchard, Director, Chesapeake Bay Institute
The Johns Hopkins University

The mean flow of the Susquehanna River at Marietta, Pennsylvania, the last regular gaging station on the river has, during the 33 years of record October 1931 through September 1964, averaged 35,880 cfs. Additional drainage to the river between Marietta and the mouth of the river provides for a long term average discharge into the head of Chesapeake Bay at Havre de Grace, Maryland, of approximately 40,000 cfs. The flow is, however, subject to marked seasonal and year-to-year variations. The annual average flow at Marietta has varied from a low of about 24,000 cfs to a high of about 48,000 cfs, or a fluctuation about the mean flow of ± 50%. The seasonal fluctuation is of course much more extreme. For example, during the water year October 1963 through September 1964, the average discharge at Marietta during March was 134,900 cfs, with a daily maximum flow during that month of 458,000 cfs, while during September the mean flow was only 2,296 cfs, with a minimum daily discharge of 1,450. The mean flow during March was then some 4.2 times the annual average for the year, and the daily maximum flow was 14.2 times the annual average. The mean flow during September was, on the other hand, only 7.2% of the annual average flow for the year, and the minimum daily flow was 4.5% of the annual average. The average flow in March 1964 was some 59 times the average flow in September.

The water year October 1963 through September 1964 showed larger seasonal fluctuations than usual. However, the seasonal variation is always quite marked. During the 19-year period 1932 through 1950, the average minimum monthly flow was 6,849 cfs, while the average maximum flow was 103,744 cfs at Marietta. September or October will be the month of minimum flow in 7 out of 10 years, while maximum flow will occur with the same frequency in March or April.

The discharge from the Susquehanna represents over 90% of the fresh water entering the upper Chesapeake Bay above Annapolis, and over 85% of the fresh water which enters the Bay above the mouth of the Potomac. This fresh water inflow is the primary factor controlling the salinity distribution in the Maryland portion of the Chesapeake Bay.

An example of the considerable effect of river discharge on the salinity distribution is shown in Figure 1. On the left side is the distribution of salinity at the surface in the upper Chesapeake Bay as observed in late April 1964, just following the period of high spring discharge, while on the right side is the salinity distribution in early November 1964, just following the period of low discharge in late summer and early fall.

The relationship between the rate of fresh water inflow to the Bay and the salinity distribution is not a simple one. The salinity at a given time at any point in the upper Chesapeake Bay depends not only upon the river discharge in the recent past but also in a complex way upon the flow history.

In the natural regime steady state conditions seldom, if ever, occur, and the temporal variations in river flow and salinity distribution seldom, if ever, are repeated. Other environmental factors than river flow also influence the salinity distribution, although to a considerably lesser degree. The distribution of salt content in the vertical depends upon the intensity of vertical mixing, which in turn is influenced by the wind velocity and the vertical temperature gradient. The determination of the relationship between river inflow to the Bay and the salinity distribution from statistical treatment of field data alone does not appear likely.

The use of theory to provide the sought for relationship, while more attractive than the statistical treatment of field data, nevertheless presents obstacles which are as yet insurmountable. Even when the full three-dimensional kinematic and dynamic differential equations are simplified to reduce the number of spatial dimensions, there remain certain parameters, such as the turbulent diffusion coefficients, which depend upon the velocity field and the distribution of density in a way not yet fully known.

The sought for relationship between river discharge and salinity distribution could be determined, at least numerically, through the use of an adequately scaled hydraulic model. Such a model has been authorized by Congress, but its construction has not yet been funded. Even after such funding is provided, several years will be required for construction and verification of the model. As is pointed out by Dr. Cronin in the paper he is presenting at this meeting, the salinity distribution in the upper Chesapeake Bay is an important environmental factor, both directly and indirectly, with respect to the valuable commercial and sport fisheries of Maryland. Before any significant modification of the natural river flow regime is agreed upon, the effects of such modification on the salinity regime in the upper Bay should be firmly established through use of an adequately scaled hydraulic model.

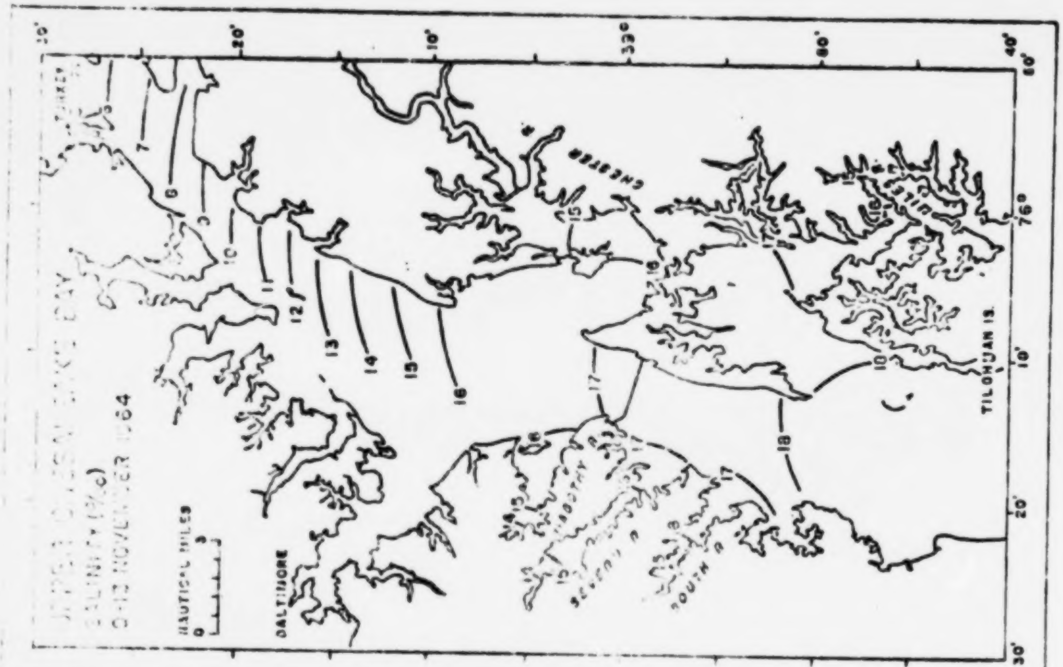
For the purpose of preliminary planning, a first order estimate of the effects of diversion of flow from the Susquehanna drainage basin is desirable. A combination of theory with a statistical treatment offers the possibility of such a first order estimate.

We are engaged in the development of such a first order estimate using the simple, one-dimensional equations for the salt-balance coupled with salinity data collected in the upper Chesapeake Bay during the last seventeen years. Very preliminary results of this development for a location in the upper Bay adjacent to Pooles Island are presented here. Figure 1 shows that following the period of high spring river discharge in 1964 the salinity off Pooles Island reached a low of about 1‰, and following the autumn period of low flow the salinity at this location in the upper Bay exceeded 12‰. Observations during other years show that essentially fresh water can occur for brief periods of time off Pooles Island following prolonged periods of very high river discharge, and that maximum salinities at this location may exceed 13‰.

The preliminary results of our study to date indicate that the rate at which the salinity off Pooles Island changes with river discharge is, to the first order, proportional to the salinity. Thus, even without an explicit relationship between the salinity and the past time history of river discharge, we can estimate how much the salinity would increase at this location, over that which would naturally occur, for a given diversion of flow from the Susquehanna water shed.

Figure 2 gives our preliminary results in the form of a graph of the increase in salinity, Δ S, as a function of the salinity S, for a diversion of 1000 cfs. This Figure shows that a diversion of 1000 cfs would produce an incremental increase in the salinity of about 10% of the salinity which would occur without diversion.

In addition to directly influencing the distribution of salinity in the upper Bay, the rate of river discharge effects the degree of vertical stratification and the non-tidal circulation pattern. Both of these environmental factors influence the productivity of the area and the distribution of organism, and hence ultimately the suitability of the upper Bay as a spawning and nursery area for species important to commercial and sport fisheries. Again, an adequately scaled hydraulic model would be an invaluable aid in determining the effects of river flow modification on these environmental factors.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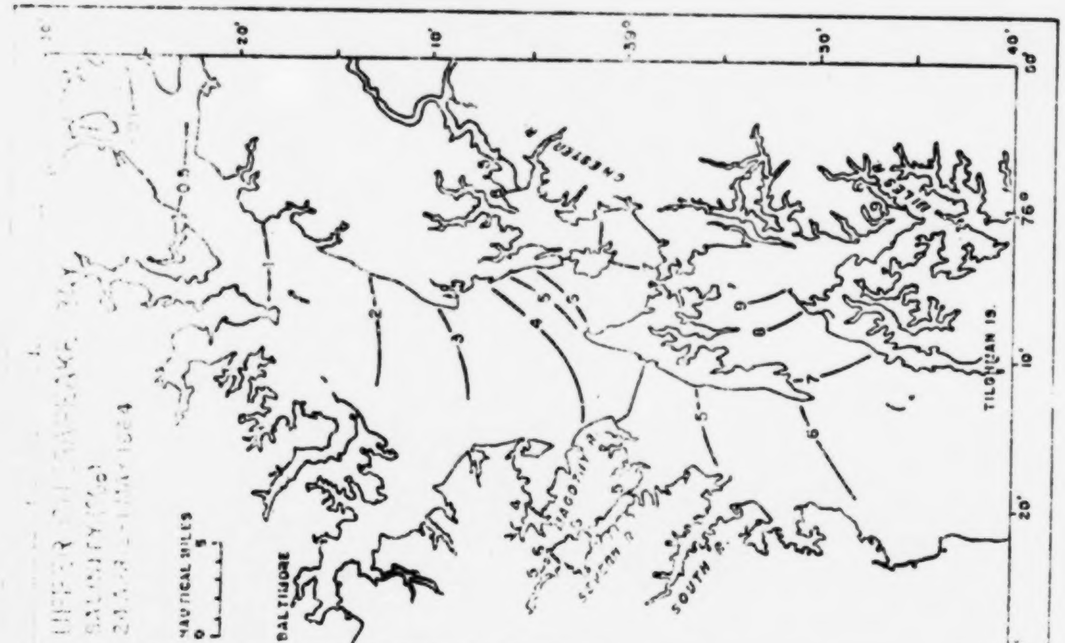
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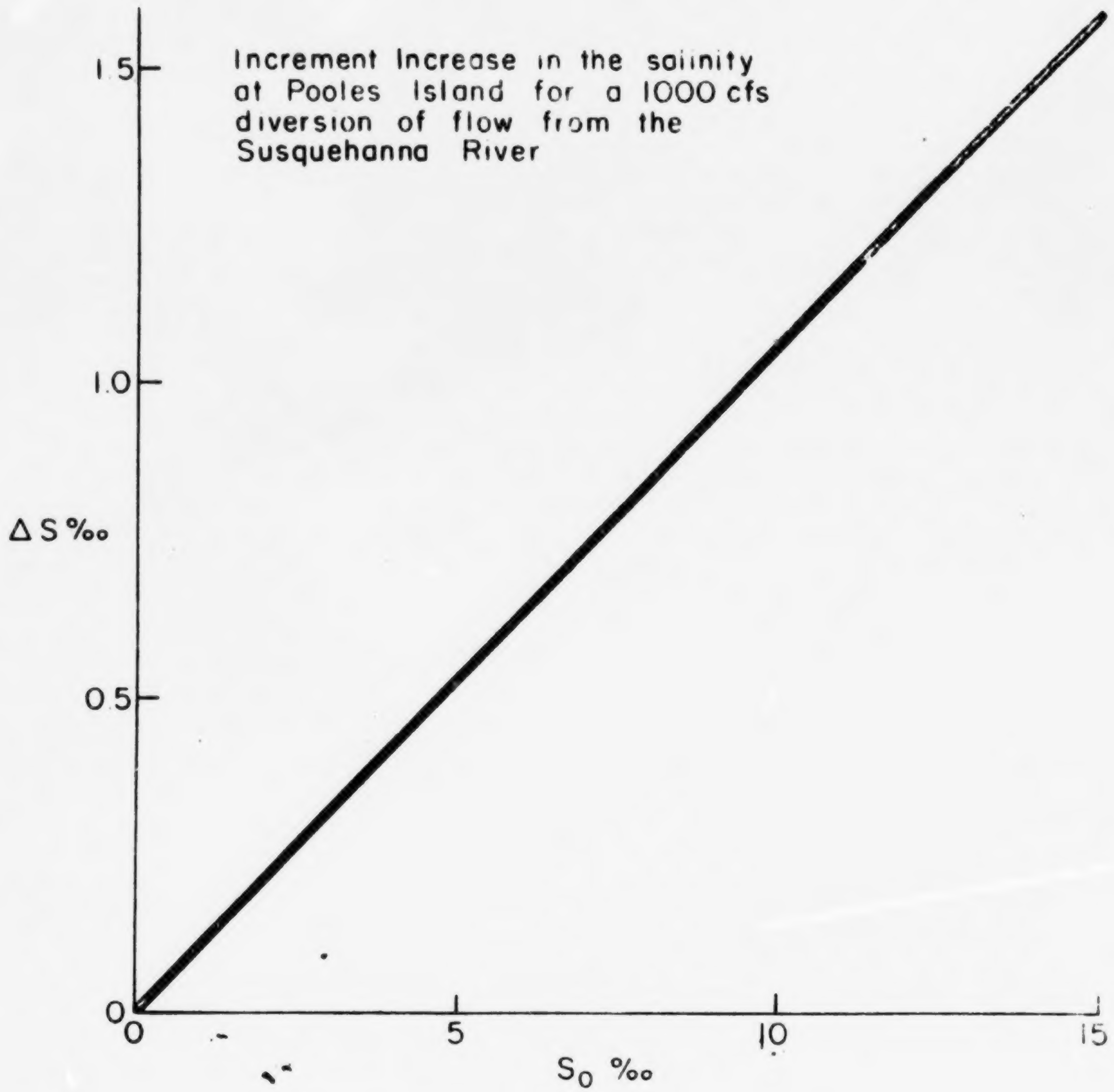

Increment Increase in the salinity at Pooles Island for a 1000 cfs diversion of flow from the Susquehanna River
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S0 ‰

CHESAPEAKE BAY WATER SUPPLY NEEDS -
THE BIOLOGICAL POINT OF VIEW [1]

4 October 1966

L. Eugene Cronin
Director and Research Professor
Chesapeake Biological Laboratory
Natural Resources Institute
University of Maryland

The quantity and quality of water flowing from the river portion of the Susquehanna into the estuarine portion of the Susquehanna (more usually called the Chesapeake Bay) are of critical importance to the welfare of organisms of the Bay and to the hundreds of thousands of people who use those organisms. Knowledge is not yet sufficient to place precise figures on the effects of the River, but it is sufficient to demonstrate that those effects are large and can involve severe damage to or great enhancement of the uses of the Bay. I propose to describe briefly the biological system in the Bay, summarize the animals and plants involved, provide some specific examples of the effects of the River, comment on the requirements for river flow, and make several specific recommendations.

THE BIOLOGICAL SYSTEM OF THE CHESAPEAKE BAY

The Bay is an estuary - one of the most valuable and vulnerable of the world. Estuaries, where fresh water, land and sea meet in a dynamic and productive zone, have their own specific characteristics and the result is a unique and extremely productive system. In the Chesapeake a rich supply of nutrient chemicals is provided by the tributaries. The water is shallow enough and well enough illuminated to permit a high level of photosynthetic production of organic material. Physical circulation of the Bay and other characteristics permit it to act as a nutrient trap and not merely as an open trough through which nutrient materials pass to the sea.

Part of the production is accomplished by microscopic phytoplankton. Additional production occurs in the large rooted plants which are also an important contributor to the Bay.

The next step in the food chain consists principally of the zooplankton or microscopic drifting animals. While these are not as diverse as in the ocean, the quantity of food available in this form is much higher than that present in the River or in the ocean. This is probably the most important of all fish foods.

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[1] Presented to the Eleventh Meeting, Susquehanna River Basin Study Coordinating Committee, Elmira, N. Y.

Another very important part of the food web is found in the rich bottom community. The oysters, clams, crabs, and a variety of other organisms which remain in or near the bottom are able to feed on microscopic organisms of the Bay and trap the energy contained in the available food. These benthic crops offer one of the greatest opportunities in the world for increased food production.

At the top of the food chain, the Chesapeake contains variety of fish. Some of these are permanent residents, including rock, white perch, yellow perch, anchovies, gobies, silversides, hog chokers, and many others. Each of these is totally dependent for survival and abundance on the salinity conditions, food supply, and perhaps on the pattern of circulation present in the Bay.

The second important group of fish is composed of various kinds of visiting species. Some of these move into the Bay as adults to feed on the rich supplies available. Flounders, trout, blue fish, drum fish, and others follow this pattern annually.

The Bay is also visited by anadromous fish which spend their adult life in the ocean but must return to the estuary and to fresh or nearly fresh water to spawn. These include several species of herrings and shad. They must find enough clean water for spawning and they utilize the tidal fresh and low salinity area of the Bay as the nursery for their young. Conditions in that region probably determine the size of the crop produced.

Another group of fish is dependent on the Chesapeake Bay in a rather peculiar way. These species spawn in or near the ocean but their larvae are carried up toward the head of the Bay by the upstream drift of bottom water and reach the large crops of food present in most low salinity areas. These include menhaden, one of the herring, weakfish or sea trout, spot, croaker or hardhead, harvest fish, winter flounder, drum and others. All of these depend on the upper Bay from the tidal river to a salinity of about 10 ^{o}/oo as their nursery ground.

Every single step on this chain of food is affected by and depends on the Susquehanna River, since that river controls the supply of nutrients, the pattern of circulation, the salinity, and the general quality of water in the Chesapeake Bay.

EXAMPLES OF THE EFFECTS OF THE SUSQUEHANNA

It is possible to provide some specific examples of the effects of the River on the Chesapeake. Each of these is subject to, and requires, further study and understanding before it can be converted into precise prediction and evaluation.

1. The principal source of nutrient input into the Chesapeake Bay is the Susquehanna River, despite the contribution made by Baltimore and other metropolitan areas. This probably controls the basic production of organic material in the Bay.

2. Many of the tributaries in the Bay and the Bay itself are flushed by the flow from the Susquehanna. The circulation of Baltimore Harbor and of most of Maryland's rivers and many of those in Virginia responds directly to the quantity of water flowing from the Susquehanna. Therefore, the capacity of these waters to absorb wastes, to utilize nutrient enrichment, or to transport dissolved materials is largely dependent upon the River.

3. Silt from the Susquehanna was once an important and destructive contribution to the Bay. This has been considerably reduced by the constuuction of dams but the quantity of silt flowing down, especially during the spring spawning season of many fish, can still be destructive.

4. The most abundant small crustacean in the Bay is the copepod Acartia. It is present throughout the year and provides much of the food available to young fish and other species. The enclosed two figures show the change in salinity distribution in Delaware Bay as a result in change of river flow and the change in distribution of this food for fish in response to those changes of river flow. We do not know as much about seasonal changes in the Chesapeake but it is probably that this kind of pattern occurs. Obviously, this will be of importance to those species dependent on this animal.

5. Salinity in the Bay, under the control of the Susquehanna, determines the upper limits of oyster bars and of clam beds. The average upper limits of these bars are set by long-term patterns but floods from the Susquehanna have been demonstrated to destroy large and important oyster beds.

6. Conversely, salinity in the Bay may now be controlling the downstream limit of oyster bars. The parasite MSX and the predatory snail Urosalpinx are found in the high salinity area of the Bay. Their upstream penetration is controlled by salinities of about 15 °/oo. Recently, dry summers have permitted both MSX and these snails to penetrate farther into the Bay and destroy valuable oysters up as far as the Choptank River.

7. Salinity distribution in the Bay probably affects the abundance and certainly affects the distribution of the troublesome sea nettle. Recent research at the Chesapeake Biological Laboratory has shown that the polyps exist up the Bay to a salinity of about 6.7 °/oo. The adults are somewhat more tolerant and can stand salinities at least as low as 5.0 °/oo. The abundant ctenophores, or comb jellies, are eaten by sea nettles and in turn consume oyster larvae and fish eggs, as well as copepods. They are limited in their upstream distribution by a salinity of about 4.3 to 4.9 °/oo. Two predators which we have recently observed to feed on sea nettles are also probably controlled by salinity although observations are as yet incomplete. One of these is a migratory fish and the other is a small snail-like mollusk. In addition, there is a widespread belief that sea nettles are far worse in years of low spring runoff of the Susquehanna and much less troublesome in years of high runoff. This has not yet, however, been tested properly.

8. The fish of the Chesapeake, especially in their vulnerable egg and larval stages, are intimately and dependently related to the salinity regime and to other results of Susquehanna runoff.

Rockfish or striped bass appear to spawn very near the interface between fresh water and low salinity water. The precise location and quantity of this interface water may be one of the most important factors in determining whether or not a large crop is produced. The upper Chesapeake is the greatest spawning area for striped bass in the entire world. In addition, it has been strongly suggested that the dynamic flow of waters in the upper Bay may be essential to these fish. It may transport the eggs downstream beyond the heaviest silt concentration prior to the development of the larvae. It is also obvious that the quantity of silt present in the water can, in some years, be destructive to the eggs of many species.

All of the marine spawning fish which have larvae that are transported up the Bay by the deep water movement of channel waters are dependent upon the circulation of the Bay. Their transport occurs only because of the flow of the Susquehanna and other rivers. Any substantial change in that flow may mean that these fish are less successful or more successful in reaching their essential nursery ground.

9. New plants invading the Chesape[illegible] controlled by salinity. Water chestnuts require virtually fresh [illegible] while Eurasian water milfoil can prosper in salinities to about 15 [illegible] iver flow determines the location of these controlling environm[illegible] efore, partly determines the areas which may be damaged.

10. One of the distinctive hydrogr[illegible] features of the Chesapeake Bay is the massive depletion of oxygen [illegible] north-flowing waters of the central Bay during the summer. [illegible] extent and duration of this depleted area, as well as the econom[illegible] damage from it, are largely controlled by the amount of fresh water flowing down the Bay. Larger flows of light, fresh, warm water on the surface may enlarge the area of heavier, deeper saltier, low-oxygen water. This depleted area is already known to cause extensive mortalities to crabs and may be destructive to other seafood.

ON ESTIMATING WATER REQUIREMENTS

In view of the many effects of the quantity and quality of Susquehanna water on Chesapeake organisms, it is essential that progress be made toward reasonable estimates of requirements. These are, however, extremely difficult. It is now possible to speak only in more general terms than are useful in developing water flow formulae.

1. It is abundantly clear that a great deal of additional research must be directed toward related problems. It must include thorough field studies of the natural distributuon and ecology of animals and plants, and controlled laboratory experiments on the requirements of these organisms and their response to change. Only such research can yield adequate knowledge of the value of various species and the costs and benefits of change.

2. High spring flows flush some species down the Bay but enlarge the suitable area for many fish of the region.

3. Low flows of late summer permit upstream penetration by several destructive species but also have other important hydrographic effects.

4. Species response to Susquehanna flow varies enormously. The total effect is extremely complex and cannot yet be predicted in specific detail.

5. The general targets for management of Bay species may include enhancement of summer flows, prevention of excessive enrichment, prevention of all types of toxic materials, reduced silt, and maintenance of high spring flows.

RECOMMENDATIONS

1. That the biological effects of the Susquehanna on the Chesapeake be fully recognized as one of the great areas of effect to be considered in managing the Susquehanna watershed.

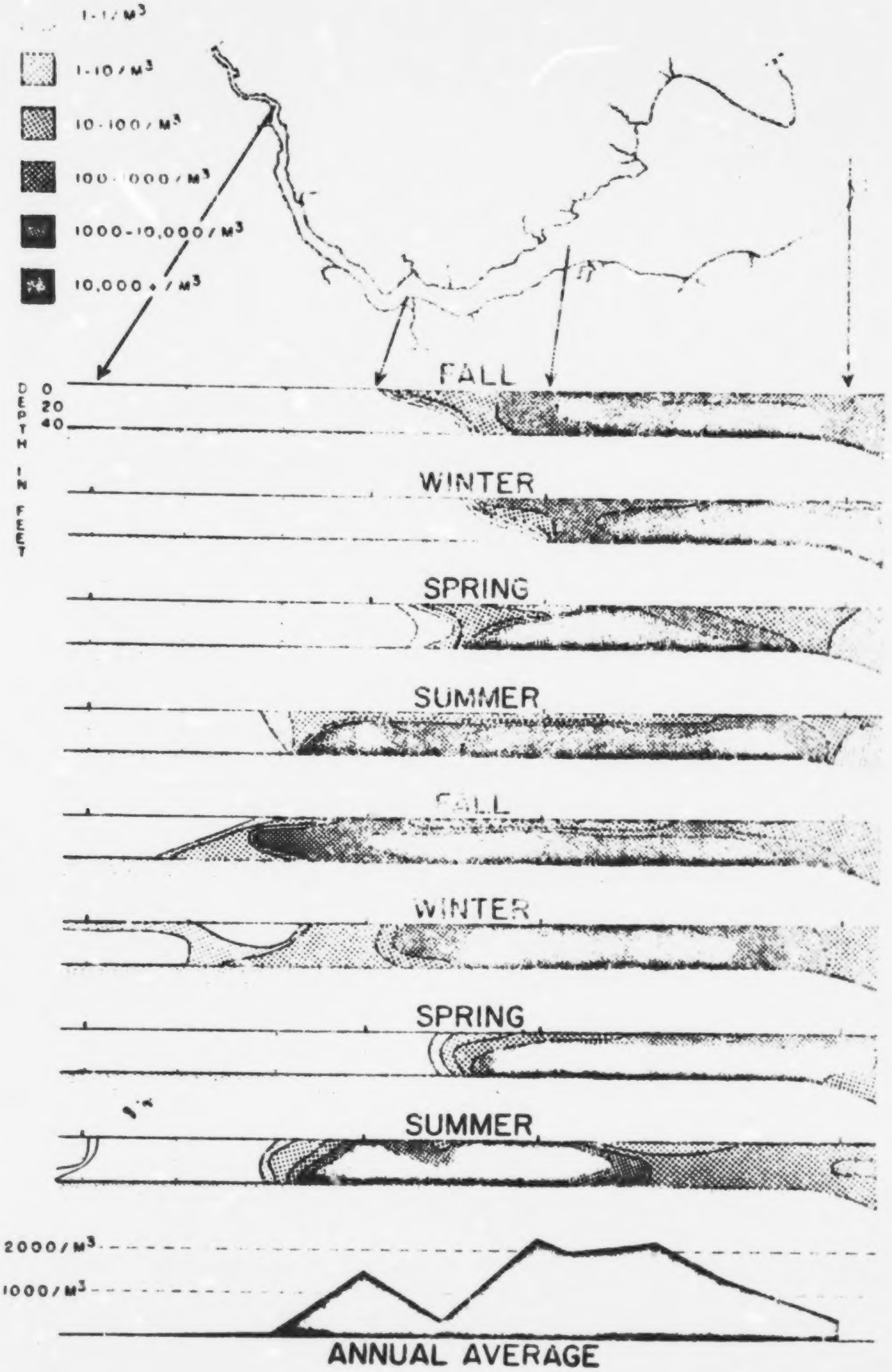
2. That the best possible estimate of the biological effects in the Bay be sought as part of the evaluation of each proposed change in the quantity and quality of water reaching the lower Susquehanna.

3. That changes in flow be managed most conservatively in view of the limited knowledge of their effects. Perhaps a positive moratorium on such changes should be considered.

4. That all avenues toward improving prediction of effects of the River on the Bay be followed vigorously. This must include extensive and competent field and laboratory research and should utilize all possible constructive techniques, including hydraulic and mathematical models.

E-6

ACARTIA TONSA



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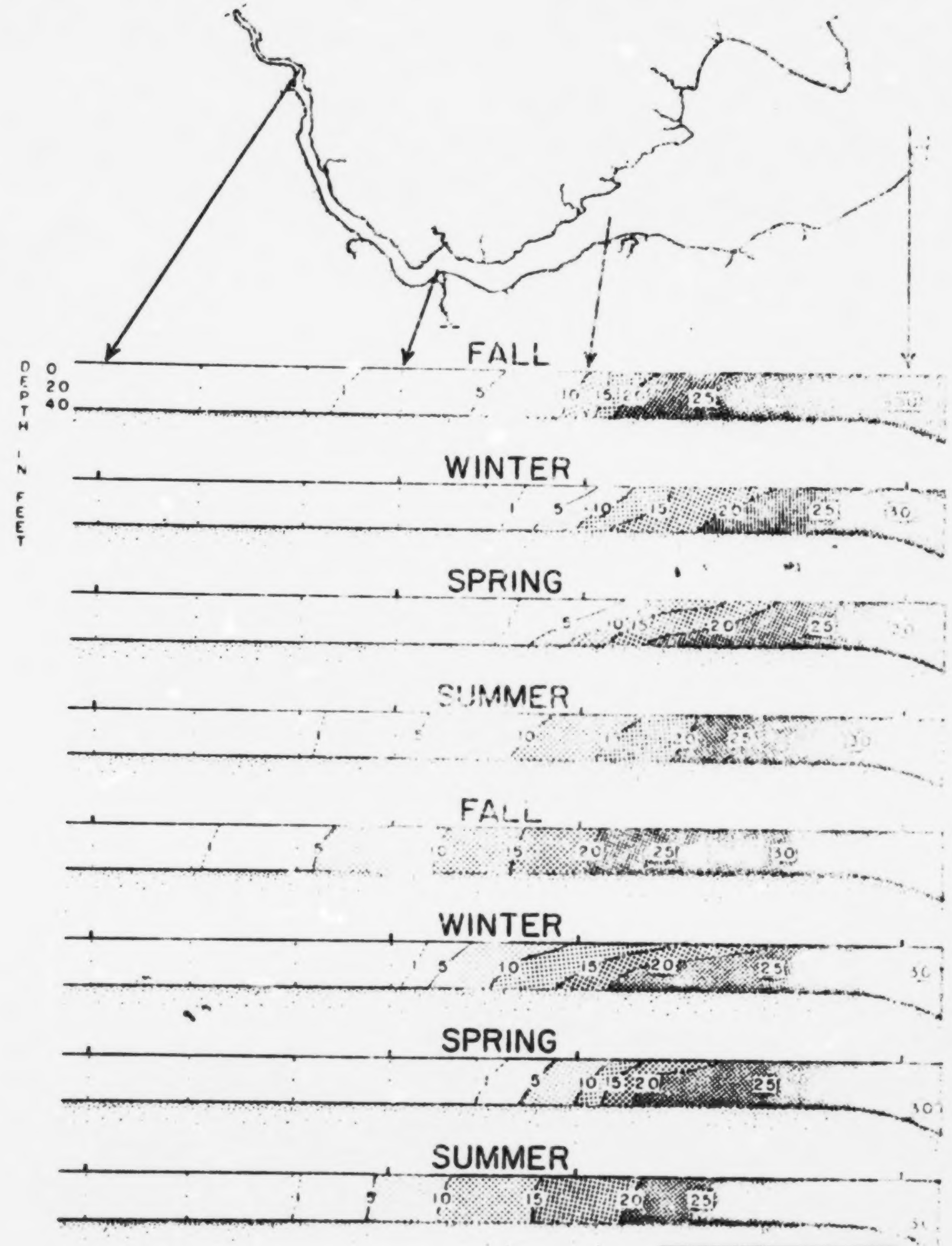

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PLANNING THE MANAGEMENT OF MARYLAND WETLANDS

Roy G. Metzgar* and by David A. Wharton**

Presented at the Twenty-Second Annual Conference of the
Southeastern Association of Game and Fish Commissioners,
Baltimore, Maryland, October 20-23,1968.

Purpose

The purpose of this paper is two-fold. First, it is intended to acquaint you with recent activities in Maryland concerning wetlands management. Second, there seems to be a lack of published information on the subject of resource planning for fish, wildlife, waterfowl, and especially wetlands management. Notable exceptions are (California, 1966), (Delisle, 1966), and (Stokes, et al, 1967). With regard to the lack of published information, we are not suggesting or claiming to fill the void (if one does exist), but intend merely to discuss our recent experiences with the planning process and wetlands.

To achieve the purposes just stated, this paper discusses previous study activity on Maryland wetlands. Then consideration is given to planning guidelines that we believe are essential to a wetlands study and formulating an eventual management plan. Next, discussion elaborates on procedures developed to incorporate the guidelines in the current study in Maryland. A general overview summary of the current study's results to date concludes this presentation.

Background

Recent concern about the preservation and proper management of all wetlands in Maryland resulted in the passage of House Joint Resolution No. 2 (HJR 2) by the 1967 Maryland Legislature. This Resolution requested "that the State Planning Department, in cooperation with the Board of Natural Resources and the Department of Economic Development, prepare a detailed long-term plan for the optimum use of all Maryland wetlands, such plan to be based so far as is possible upon the results of economic, biologic, hydrologic, and recreational research previously completed or underway in Maryland and in other states or nations having comparable wetland types and functions" (Maryland, 1967).

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Wetlands are defined by HJR 2 as those "areas on which standing water, seasonal or permanent, has a depth of six feet or less and where the wet soil retains sufficient moisture to support aquatic or semi-aquatic plant life." Thus, wetlands is a collective term for areas of varied ecology more widely known as swamps, sloughs, marshes, bogs, and mud flats.

Prior to passage of HJR 2 in 1967, a number of studies of an inventorial nature had been conducted on Maryland wetlands. These studies include: Maryland Marshes (Nicholson and Van Deusen, 1954), Wetlands of Maryland (Nicholson and Van Deusen, 1956), Permanent Water Inventory - Maryland (Nicholson and Van Deusen, 1956), Waterfowl Populations in the Upper Chesapeake Region (Stewart, 1962), and Classification and Inventory of Habitats in Maryland (Maryland State Planning Dept., 1965).

Noting the lack of wetlands legislation in Maryland, it is apparent that none of these studies generated a successful legislative response. This finding is consistent with the intent and inventorial nature of each study since none of them dealt with the need for wetlands legislation. However, each study suggested that wetlands should be preserved. There is one notable exception which is mentioned here for passing historical interest only. This study, the Report of the Conservation Commission of Maryland for 1908-1909, stated that:

> "Very little attention has hitherto been directed to the extensive swamp and marshlands of the State which if reclaimed would add greatly to the total area available for agricultural production.

> "It requires little argument to show that this vast area of unproductive land, which might become the richest in the State, should be made available for agricultural purposes at the earliest opportunity."

It is interesting to note the apparent negative attitude of the Conservation Commission regarding the natural values of wetlands. Such statements might cause one to wonder how existing wetlands acreages have survived to this time. Also, the statements suggest one of the problems a wetlands plan must handle—misconceptions about the natural values inherent in wetlands.

It is essential to establish a clear and mutual understanding of the terms or concepts--planning and plan--used throughout this paper. We perceive planning, including its processes and results, to be the systematic application of analytical techniques to the identification of problems, and the thoughtful and deliberate preparation of appropriate responses. The result or objective of such activities is to sharpen the focus on the problem at hand in order to promote and improve the background needed for wise decisions. The wetlands management plan that is anticipated from the current study and planning efforts on wetlands is not envisioned as a fixed projection or blueprint which is to be followed faithfully without present or future alteration or modification. Nor are we attempting to answer the question of how the planning function can best be implemented with regard to wetlands. For there is probably no single, simple one best method. Therefore, the planning activities and resulting wetlands management plan discussed herein should not be construed as the ultimate answer to providing management tools. Rather, methods discussed here are suggested as initial means of improving the decision-making process for administrators so that those who are concerned and responsible will be better prepared to act.

Guidelines Essential to Formulating a Wetlands Study and Management Plan

Guidance in formulating a wetlands study that would develop a management plan was sought from previous wetlands studies, recent publications on resource planning and from another resource management field with much to offer in terms of planning experience--water resources.

Previous wetlands studies (besides those in Maryland) were useful in providing historical perspective, supplying ideas on study organization and methodology, and furnishing previous inventory information (when applicable). More importantly, however, such studies suggested what was inadequate or ill-advised to do in generating desired responses in terms of wetlands legislation or management policy. Studies of a survey or inventorial nature exclusively are satisfactory for their scope, but apparently are unsatisfactory from a legislative policy standpoint for several reasons. First, the information assembled probably presents too narrow a perspective to legislators. Previous studies were notably single-purpose--preservation of the status quo concerning wetlands habitat, the shortcomings of which are described in "The Fallacy of Single-Purpose Planning" (Gilliam, 1967). Gilliam suggested that planning must move toward a multiple-purpose concept so that recognition will be given to the full spectrum of human needs. Whereas, single-purpose planning generally disregards shifting demands, determining the multiplicity of uses from the same resource base, a changing environment (natural or man-made), accounting total environmental impacts from man's activities, and assessing other dynamic factors of contemporary society. Consequently, single-purpose (inventorial) wetlands studies probably were inappropriate for generating any response from decision-makers. If wetlands were worth preserving at the time of previously cited studies, then those efforts should have been commensurate with the value of the resource.

Second, most of the previous studies examined showed evidence that their findings were obsolete before completion. A major problem for resource planners and managers is measuring and evaluating the many different uses of the resource base. Frequently, the resource base being measured is experiencing changes in intensity or frequency of use during the course of a study. Also, the uses and users themselves are often changing both as to character and intensity. Perhaps one of the most significant facts about our environment and/or resource base is the speed at which man can cause changes to occur. And further, it is important to realize that the results or trends of yesterday's and today's changes often cannot be altered in the future regardless of one's wishes. At the current rate of change, the present becomes the past before we recognize it. Such speed drastically narrows the options of today to deal with the problems of tomorrow. With specific reference to wetlands nearly all the previous wetlands studies can be faulted for failing to grasp the dynacism of the resource being investigated, for failing to project adequately into the future and thus, failing to present sound quidance to decision makers on matters of legislation, policy and consequent managerial action.

Third, in line with what has just been said, previous wetlands studies examined were too static and inflexible for the resource being dealt with. There seemed to be a failure to recognize that other legitimate claims to shoreline frontage exist which quite often encompass wetlands. Wetland areas were valuable only as wetlands. Such philosophy seems inconsistent with reality and fails to recognize the fact that wetlands are not static but dynamic resources. What yesterday was a valuable wetland due to its natural productivity and contribution to an estuarine ecosystem may not be true tomorrow--or five, ten or fifteen years from now. Likewise, wetlands that are not of prime value today for natural productivity may be of tremendous benefit in the future. Wetlands by themselves represent resources that are in continuous natural transition. Consequently, the inflexible philosophies apparently behind previous studies produced results inconsistent with the resource at hand and traditional management problems.

What is suggested or required for an effective wetlands plan is the inclusion of some mechanism or technique which will produce results with inherent flexibility. Flexibility, meaning the capability to rapidly and effectively update, augment, revise, or review inventorial results, is necessary in a wetlands management plan to provide legislators, planners, administrators or private citizens with an accurate and timely status report on the State's wetlands resources.

Further amplification of the planning function and flexibility is provided in Maryland's Role in Water Resources Development (Craine, 1966). In discussing water resources planning Craine states that: "The emphasis must be on flexibility for adjusting to changing needs as we move nearer to and become more certain of future conditions which at first may only dimly be perceived."

Now turning for a moment to a brief examination of the Federal Government's experience with water resources development--one finds that originally it was based on single-purpose planning. Initial Federal ventures were the result of Congressional laws and policies of limited scope that were generated to deal with specific problems in particular areas. Examples are navigation on the lower Mississippi River Valley, irrigation in the reclamation programs for western states, and flood control again in the Mississippi River Valley. Gradually, it became apparent to those concerned that resources were interrelated and a need was recognized for multiple-purpose systems to develop several resources simultaneously. Also, the view developed that if comprehensive plans were formulated resources would be used more productively. Thus, there was a transition of philosophy, with regard to Federal activity, from single-purpose planning for particular places to multiple-purpose and comprehensive planning for entire river basins or regions.

A recent examination of water resources management suggests that there is a need for further refinement in water resources planning. "Management of water resources has evolved to a stage where planning should center upon the needs of people rather than upon water per se," (N.A.S., 1966). This is an important point and very applicable to natural resource planning. What is the objective of a fish, wildlife or waterfowl management plan? Are we preserving and managing these natural resources for their own sake? Are we doing so because of the intrinsic values their existence represents to people? Are management endeavors directed toward producing a type of goods and services consistent with contemporary society's tastes and high standard of living? The answer to these questions would probably be that all of these objectives are being sought but with different degrees of intensity for each purpose. The ultimate planning question for fish, wildlife and waterfowl might evolve to be--what is the optimum mix that can be produced or that should be produced--for people?

The Federal Government's experience has not been lost on those concerned with water resources development in Maryland. "All use of water and the development of the water resources shall be on a multiple-purpose basis... Recreation and the related fish and game activities shall be considered co-equal purposes in such planning..." (Maryland State Planning Dept., 1961).

More pertinent to our subject, wetlands planning, than the above philosophical statements about water resources and planning are comments on estuarine problems by Secretary of the Interior, Stewart L. Udall. He suggests the need for integrating all resources within a common planning framework to facilitate effective environmental management.

> "It is clear that the estuaries must be considered as a total resource system and not simply as a 'water resource' at the end of a river.
>
> "There is a clear recognition within the Department of the Interior that the future welfare of the estuaries depends upon the control of water pollution, on an adequate supply of fresh water for salinity regulation, on controlling dredge and fill operations, and on effective community planning and/or zoning which recognizes the interactions between water and land use."*

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* Statement made before the Subcommittee on Air and Water Pollution, Committee on Public Works, U. S. Senate, March 27, 1968. p. 16.

By reviewing previous wetlands studies, by examining the transition of planning in Federal water resources projects and by observing the impressions of others on the planning function concerning Maryland's water resources, two principal planning guidelines emerged for the current ongoing wetlands study in Maryland. These are:

1) that a wetlands study (or plan) must be comprehensive - meaning consideration should be given to all problems that center on wetlands in addition to seeking management techniques to preserve natural productivity; and
2) that a wetlands study (or plan) must have flexibility built into it - not only in terms of comprehensiveness, but a structure which is capable of being continuously up-to-date and therefore, can rapidly define, assess and provide accurate information about the resource base to planners, managers or whomever has a need for such information.

Developing a Comprehensive Wetlands Study

To insure comprehensive planning coverage of all problem areas related to wetlands and to coordinate all potential study inputs, a wetlands technical advisory committee (WTAC) was created by the Maryland State Planning Department. The committee is comprised of representatives from State agencies and organizations having any concern with wetlands. Meetings were held to organize the committee, establish a study outline, coordinate study activities, and familiarize everyone with the planning requirements essential to fulfilling the objective of HJR 2. From committee work a study plan* developed that outlined essential research and investigational activity on Maryland's wetlands. The Department of Game and

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* Maryland Wetlands Project drafted by the Director and staff of the Department of Game and Inland Fish for the Maryland Board of Natural Resources. Unpublished and undated (mimeo).

Inland Fish study plan suggested six phases or segments representing major areas of concern. The study as adopted and currently in the process of completion is structured to produce a workable plan for wetlands management. Due to the diversity and magnitude of the project and to insure a thoroughly comprehensive study, members of the WTAC were assigned specific responsibilities in different segments of the study. Or they were requested to provide expertise guidance or assistance as required by the State Planning Department throughout the duration of the study. Figure 1 shows the composition of the WTAC with each member's general areas of participation in the different segments of our comprehensive wetlands study.

Wetlands Habitat and Competing Uses Inventory - Segment I

Responsibility in Segment I was assigned primarily to the Department of Game and Inland Fish (GIF). However, later in the study extensive support efforts were provided by summer field work conducted by the University of Maryland's Natural Resources Institute. Also, the University's Department of Entomology has furnished information about the plans and activities of the mosquito control program. The habitat inventory developed by GIF provides the basic framework on which current planning efforts have evolved. Briefly, the methodology employed in Segment I is as follows:

(1) A set of U. S. Geological Survey's quadrangle topographic maps (Scale = 1:24.000) was assembled which covered the entire State.

(2) All areas charted or indicated as wetland types after Circular No. 39 (Shaw and Fredine, 1946) were assigned a specific identification number unique to the particular county in which the wetland is located. For practical purposes an acreage limitation of at least five (5) contiguous acres per wetland was imposed for inventorial consideration.

Wetlands Study Segment	Objectives of each segment	Wetlands Technical Advisory Committee										
		Board of Natural Resources	Chesapeke Bay Institute	Dept. Chesapeke Bay Affairs	Dept. Economic Development	Dept. Forests and Parks	Dept Game and Inland Fish	Dept. Water Resources	Md Geological Survey	Md. State Planning Dept	U. Md. Natural Resources Institute	U. Md Dept. Entomology (Mos. Control)
I	Wetlands habitat inventory						X				X	
	Inventory of competing uses						X					X
II	Assess wetlands real estate values					X	X			X		
	Wetlands dependent production	X		X			X			X	X	
	Recreational uses and values	X		X	X	X	X				X	
	Ecological values	X		X			X			X	X	
	Identify ecologically unique areas	X	X	X		X	X			X	X	
III	Wetlands-aquifers relationships								X			
	Wetlands-shoreline erosion								X			
IV	Investigate wetlands/estuarine pollu.		X				X	X		X	X	X
V	Evaluate Segments I II III			X	X		X			X	X	
	Outline problems - potential solutions									X		
	Review Maryland laws - wetlands									X		
	Review other states' wetlands laws									X		
	Develop wetlands data process sys									X		
VI	Organize study results									X		
	Develop wetlands mgmt plan									X	X	
	Develop wetlands legislation			X			X	X		X		
	Adopt plan recommendations	X	X	X	X	X	X	X	X	X	X	X
	Produce final report									X		
VII	Conduct public hearings	X			X					X		
	Advise Maryland Legislature	X		X	X		X	X		X	X	X

Note:
The order of the segments does not represent the study sequence of events. Some segments occur simultaneously.

Figure 1. Wetlands Technical Advisory Committee with each member's general areas of participation in the different segments of the wetlands study

(3) Acreage measurements were made manually with either a grid (dot system) or a planimeter. Conversion factors of 1.43 acres per grid dot or 91.8 acres per planimetered square inch were utilized.

(4) The accuracy of the information on wetlands' losses obtained from the USGS maps was verified by a Statewide aerial reconnaissance which also authenticated the manually identified wetlands and augmented the inventory with a visual assessment of the wetlands' present physical situation.

(5) For shallow water offshore areas (0 to 6 feet depths) appropriate U. S. Coast and Geodetic Survey charts were utilized to determine and compute estuarine areas within the HJR 2 definition of wetlands.

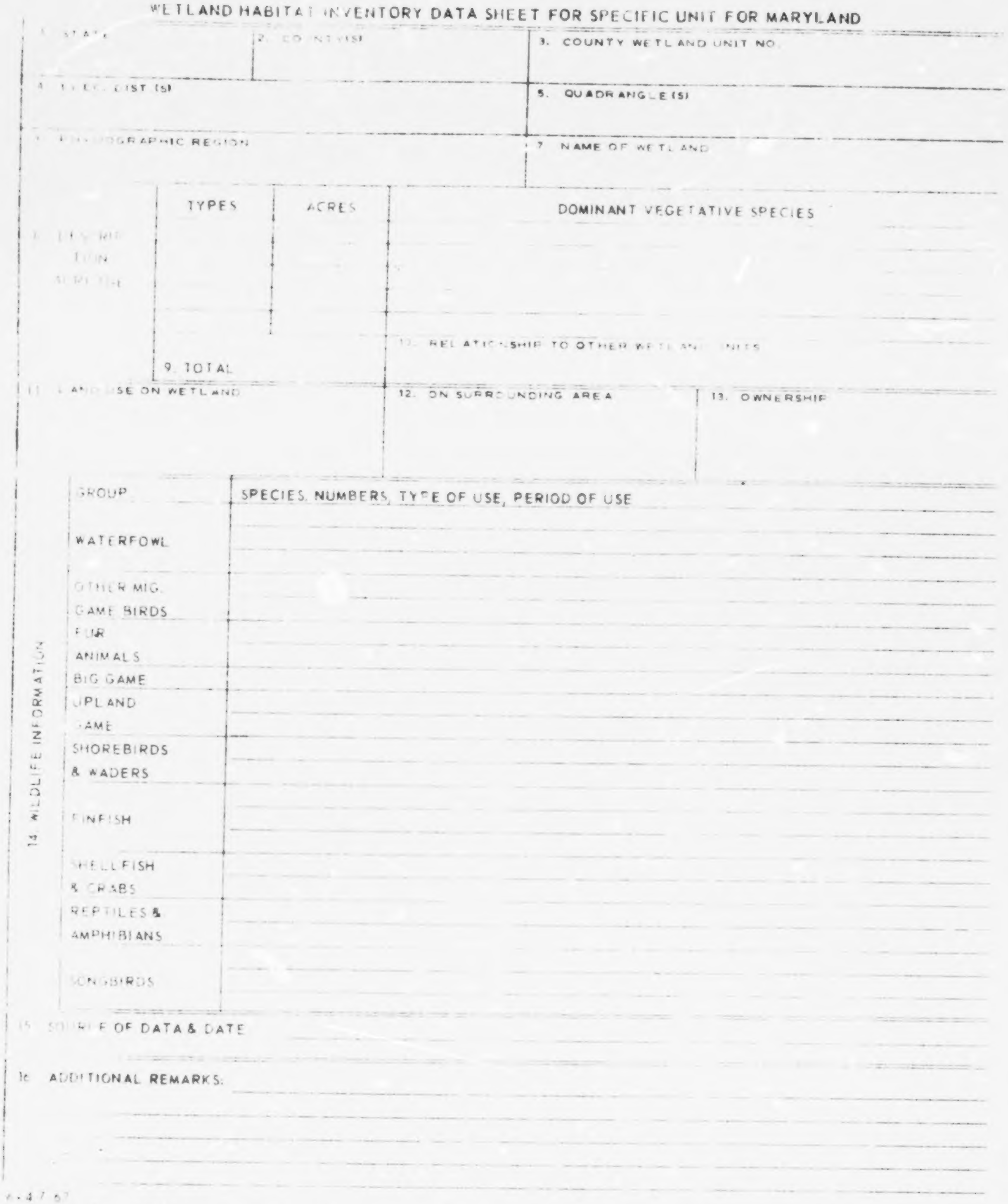
(6) Habitat inventory information was obtained on each wetland by field surveys and interviews with cognizant GIF management and enforcement personnel. Information obtained was recorded in encoded language on the respective wetlands habitat inventory data sheet originated for each specific unit identified during the course of the study (Figures 2 and 3).

(7) Results and activities of the previous step were used to determine the wetlands vulnerability to changes from other influences or uses and recorded on the inventory data sheet (Figure 3). Wetland vulnerability was subdivided into four categories representing possible present and future conditions.

Category I - (highly vulnerable) - classifies wetlands experiencing man-made changes or assessed as having that possibility within the next five years.

Category II - (moderately vulnerable) - classifies wetlands that are generally in private ownership where destructive changes can be anticipated within the next ten years.

Category III - (safe) - classifies wetlands that are highly inaccessible or isolated from societal activities, or are in the ownership of wealthy ...



WETLAND HABITAT INVENTORY DATA SHEET FOR SPECIFIC UNIT FOR MARYLAND

1. STATE
2. COUNTY(S)
3. COUNTY WETLAND UNIT NO.
4. ELEC. DIST (S)
5. QUADRANGLE (S)
6. PHYSIOGRAPHIC REGION
7. NAME OF WETLAND
8. DESCRIPTION SURFACE

TYPES	ACRES	DOMINANT VEGETATIVE SPECIES
9. TOTAL		

10. RELATIONSHIP TO OTHER WETLAND UNITS
11. LAND USE ON WETLAND
12. ON SURROUNDING AREA
13. OWNERSHIP

14. WILDLIFE INFORMATION

GROUP	SPECIES, NUMBERS, TYPE OF USE, PERIOD OF USE
WATERFOWL	
OTHER MIG. GAME BIRDS	
FUR ANIMALS	
BIG GAME	
UPLAND GAME	
SHOREBIRDS & WADERS	
FINFISH	
SHELLFISH & CRABS	
REPTILES & AMPHIBIANS	
SONGBIRDS	

15. SOURCE OF DATA & DATE
16. ADDITIONAL REMARKS:

6-4-7-67

Figure 2. Wetland habitat inventory data sheet for a specific unit (page 1 of 2).

17. ASSESSMENT OF VALUES AND VULNERABILITY

ASSESSMENT OF WETLAND VALUE

USE	VALUE	SPP. OR TYPE	REMARKS
HUNTING			
FISHING (SPORT)			
FISHING (COMM.)			
TRAPPING (FURS)			
BIRDWATCHING			
OTHER RECREATION			
F. & W. REPROD.			
UNIQUE HABITAT			
UNIQUE WILDLIFE			
IMPROV. CAPABILITIES			
OTHER ____________			
OVERALL RESUME			

ASSESSMENT OF VULNERABILITY

FACTOR	VALUE	TYPE	REMARKS
INDUSTRY			
HOUSING			
CHANNELIZING			
PUBLIC WORKS			
AGRICULTURE			
MOSQUITO CONT.			
POLLUTION			
EROSION			
SUCCESSION			
OTHER ____________			
OVERALL RESUME			

ACTION TAKEN FOR PRESERVATION ____________

Figure 3. Wetland habitat inventory data sheet for a specific unit (page 2 of 2).

landowners (thus, assuming property stability), or are owned by the State or Federal Government.

Category IV - (destroyed or partially destroyed) - classifies wetlands that have the natural productivity functions or capacities destroyed or reduced by either man-made or natural events. (The latter refers chiefly to shoreline erosion.)

(8) The results of Step (2), individual identification of each wetland, were transformed into county wetlands maps by using the Maryland State Roads Commission's general (county) highway maps (Scale: 1 inch = 1 mile). The location of each wetland with its number was transferred from the USGS quadrangle map to the appropriate SRC county map.

(9) By combining selected information generated by Steps (3) and (7), acreage measurements and vulnerability assessments, respectively, with the county wetlands maps produced in Step (8) it was possible to establish an effective base for communication within the WTAC. This achievement permitted a comprehensive collection and exchange of information linked to specific wetlands and facilitated the coordination of WTAC study activities. These activities are discussed in the paragraphs that follow.

Survey of Wetlands Values - Segment II

Efforts in Segment II concentrate on identifying and assessing the contributions or values derived from wetlands. Referral to "values" should not be interpreted exclusively as monetary benefits. The use of "values" here is intended primarily to mean that quality of a thing which is desirable or worthy of esteem for its own sake; that quality of being useful, estimable and important.

Figure 1 shows how study activities were distributed throughout the WTAC in Segment II. To expedite committee work and coordinate the results, a system of departmental questionnaires was devised by the State Planning Department. Each appropriate WTAC member was requested to provide certain information via answering a selected set of reference questions designed for the specific agency. The use of this technique encouraged each agency to examine and evaluate their available information and capabilities in terms of wetlands problems. Also, insight was provided as to the viewpoints and interests of the other participating WTAC members. Responses received reflected the adequacies and inadequacies of the questionnaire formulating process, the availability of relevant information, and the levels of departmental interest and awareness with wetlands problems. Fresh viewpoints and new ideas were also generated by the questionnaire evolution. The kinds of questionnaire requests and respective responses can be ascertained generally without further elaboration by inspection of the categories listed in Segment II of Figure 1 and matching them with appropriate WTAC members.

Wetlands and Aquifers and Shoreline Erosion - Segment III

Study activity in Segment III was handled by the Maryland Geological Survey. The principal endeavors were to determine the interrelationships between wetlands, either specifically or non-specifically, and the recharge of aquifers, and to identify wetlands that were protecting fast lands from wave and current caused erosion. The purpose of the latter was two-fold. First, wetlands that are being eroded or subject to it were identified. Second, if a wetland is in such condition, then an activity which proposes to fill in or on the wetland would be subject to the same natural event. Therefore, engineering projects would be required to protect and stabilize the newly created fast land, and such projects are eligible for State cost-sharing support. The State should be aware beforehand of those activities which later may require public financial support.

Wetlands/Estuarine Pollution - Segment IV

The scope of pollution problems is indicated by the numbers of WTAC members participating to varying degrees on this segment. Segment IV was originally perceived to be a straight forward identification of wetlands and adjacent estuarine areas with water quality, i.e., pollution, problems. This approach is still maintained to be viable. However, interpretation of what a degraded water quality situation means in terms of wetland/estuarine values is another matter. Other efforts indicate the complexities of estuarine pollution (Wastler, 1967). For example, Wastler points out that the effects of municipal and industrial wastes on estuaries depends not only on the characteristics of the discharged wastes but also on the nature of the receiving water bodies. Further elaboration in the *Proceedings of the National Symposium on Estuarine Pollution* (Stanford, 1967) points out many other aspects of the problem including the effects of degraded water quality on aquatic life, and the distribution of pollutants by tidal action, sunlight, temperature and other physical, chemical and biological factors. Before study conclusions are reached on wetlands/ estuarine pollution, a careful weighing of all information must be undertaken. This is not an attempt to build or justify a cause for further study, hence procrastination, but simply recognition of facts which should justly temper any planning which considers the problem of wetlands/estuarine pollution.

Plan Development - Segments V, VI and VII

The remaining study segments outlined in Figure 1 can be grouped together and collectively titled--the implementation phases of plan development. The results of activities in the preceeding segments are brought together in Segments V and VI and evaluated in terms of study objectives and problems identified during the course of the study. Before conclusions are reached and recommendations formulated the results of the previous step should be carefully meshed with the efforts invested in a review of Maryland's and other states' legal precedents and legislation pertaining to wetlands. In our study, aid was sought from a consultant on this legal phase. Also, it would be well to have the assistance of the Attorney General's office whenever possible.

Problems with legal ownership and powers of the State concerning wetlands and estuaries are important matters, and were noted as an area of major research deficiency in the *Proceedings of the Symposium on Estuarine Ecology* (U.N.C. 1966). Filling both a local and regional need are two useful publications produced recently--*State Programs for Estuarine Area Conservation* (Heath, 1968) and *Estuarine Lands of North Carolina: Legal Aspects of Ownership, Use and Control* (Rice, 1968). We anticipate that the forthcoming results of our study's legal/legislative research, *Maryland's Wetlands, Marshes and Submerged Lands in the Context of Common and Statutory Law* (Maryland State Planning Dept., unpublished) will further clarify the legal issues pertaining to wetlands and estuarine areas.

Also, an effort is now getting underway at the University of Maryland's Law School in Baltimore to study the legal problems related to the development and management of Chesapeake Bay resources. This activity is part of the Federal Water Pollution Control Administration's current National Estuarine Pollution Study.

Segment VII might be categorized as an advisory activity since it is envisioned primarily as an information and education function. The public has the right to be fully informed about the wetlands study's results and recommendations and can be expected to exercise that right. An understanding local and/or county government is just as important as an informed citizenry to eventually achieving study plan objectives. Cooperative attitudes are greatly needed from these governments. If such attitudes are to be expected and received, then local and county government must be made aware of the potential impacts and consequences of their granted powers and adopted administrative policies affecting natural resources, particularly wetlands and estuarine areas.

Just as important as advising local government will be the liaison or advisory activity by members of the WTAC with the State Legislature. Any proposed management plan, especially for natural resources, must expect a critical legislative evaluation. Germane to this issue or anticipated episode is analytical discussion in Natural Resources and the Political Struggle (Wengert, 1955). Wengert concludes that the political struggle is for access to points at which decisions are made, and the struggle is based upon winning friends alliances, and alignments as a means of influencing the course of governmental decisions. "Typical weapons are discussion and debate, persuasion and education..." Obviously, advisory activites can be concerned with all of these.

Flexibility - Wetlands Information Retrieval System

Review of previous wetlands studies lead to the conclusion that besides comprehensiveness, flexibility was a principal feature that should be incorporated into the current Maryland wetlands study initiated by HJR 2. The mechanism that can provide the desired flexibility is an automatic data processing system. A programmed, automated information retrieval system especially designed for wetlands management offers an attractive potential for rapidly and effectively handling large volumes of data and information in ways meaningful to planners and administrators.

During early segments of the current study it became apparent that the scope of the efforts being undertaken would eventually establish a data base capable of generating very large quantities of information. This impending result presented both opportunities and problems with desired flexibility.

The opportunities were: 1) all the information collected would not be available anywhere else from a single source; 2) the information assembled was keyed to specific wetland units--each wetland inventoried was designated by the county in which it is physically located and was assigned a distinct, individual number within the specific county; and thus, 3) the wetlands study had established a system of unique information valuable to many interests.

The problems included: 1) the manner in which a large volume of dissimilar information from different sources should be assembled; 2) the requirements levied against the collected information will be of diverse origin and will represent diverse interests; 3) it was essential that the data base established should be capable of being queried on any element of information present in the system; and 4) the system developed should be capable of summarizing information as well as retrieving it on demand. If all of these requirements were met, then the study should possess the ability to rapidly and efficiently provide accurate information on any facet of the wetlands study.

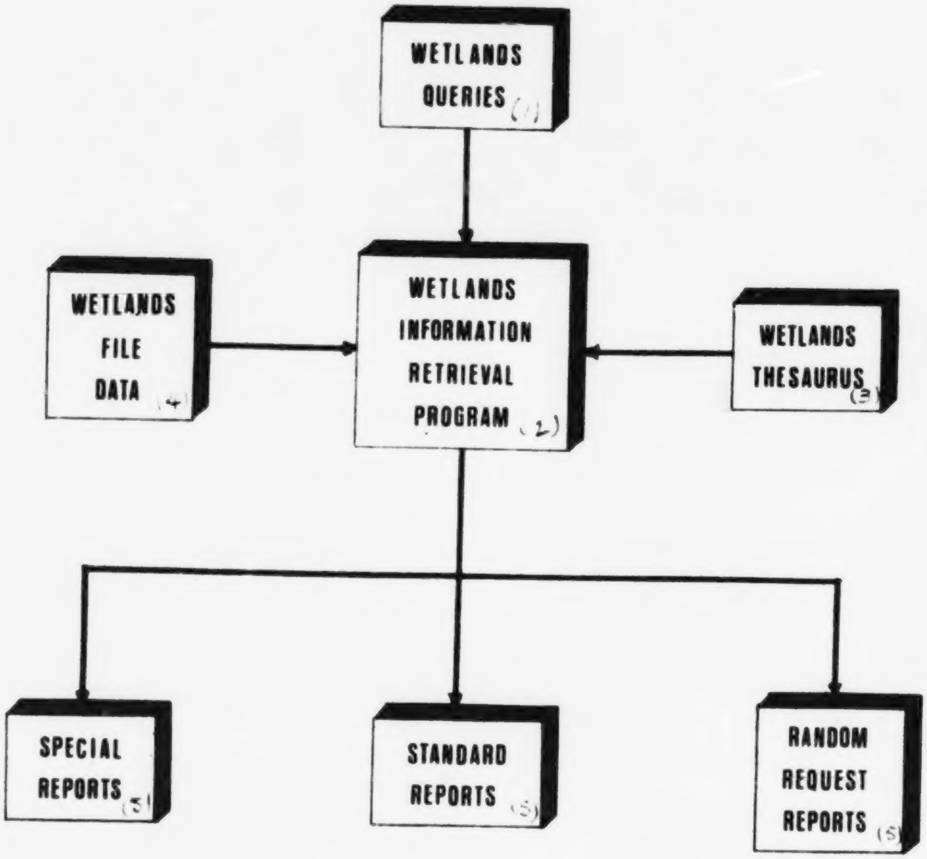
To assist the State Planning Department in establishing a wetlands data processing system which would systematize collected data, organize, store and retrieve the programmed information, contractual assistance was solicited from private organizations with competence in operations research, systems analysis, and automatic data programming and processing. From among the responses received the one most attractive on financial and operational bases was the proposal presented by Link Information Sciences (LIS) of General Precision Systems, Inc. (LIS, 1968).

The basic feature of the LIS proposal was a wetlands information retrieval system that would permit complete and immediate access to the data collected by the WTAC. The information, when encoded, would be stored in machine readable form for State-operated computers and accessed (or retrieved) by use of the proposed retrieval system.

The system being developed by LIS for the State Planning Department is a program for retrieving stored information. It is not a panacea for resolving all information problems nor does it provide decisions. The system is designed to extract answers from text data, user-specified format data and compiled file data in response to a user's query.

Figure 4 shows the basic organization and operation of the wetlands information retrieval system. A question or query at (1) is formulated to extract desired information. The question is addressed to the system's programmed information at (2). An important aid to questioning the program is the wetlands thesaurus (3), a dictionary containing all individual or distinct words, abbreviations, notations, etc., that have appeared at one time or another on all the wetlands habitat file data sheets (4) shown in Figures 2 and 3. The reply to a query will be in the format shown in abbreviated form (Figure 5). Depending upon the nature of the requested information, the response is programmed to respond and print out in either a special, standard or randowm request report format (5). Without elaborating further on technical details which are beyond the scope of this paper, it is perhaps more informative to illustrate briefly what can be produced in terms of user interest.

The system will answer such questions as what is the total acreage (of a specified wetlands habitat) for each county (Figure 5) and also for the entire State? Some additional sample question might be--list wetlands over 50 acres of Type 12 (wooded swamp) by county--by the entire State. List wetlands that possess a unique habitat value ranking of 10 (for endangered species such as the bald eagle, Haliaeetus leucocephalus, or the Bryant fox squirrel, Sciurus niger cinereus). List wetland units and acreages by county or entire State evaluated to be in the highly vulnerable category (potential acreage losses within 5 years). It should be clear by now that the question and answer combination pssibilities offered by an automatic data processing system are, indeed, endless. Moreover, as the human element gains experience with the system's capabilities and deficiencies its usefulness will be better understood, appreciated and utilized in the future.


WETLANDS QUERIES (1)
WETLANDS FILE DATA (4)
WETLANDS INFORMATION RETRIEVAL PROGRAM (2)
WETLANDS THESAURUS (3)
SPECIAL REPORTS (5)
STANDARD REPORTS (5)
RANDOM REQUEST REPORTS (5)

WETLANDS INFORMATION FLOW

Figure 4. Basic organization and information flow of the wetlands information retrieval system (Courtesy of LIS, 1968).

INPUT - LIST/WETLANDS/TYPE/5/CAROLINE/PLANT

OUTPUT - LIST/WETLANDS/TYPE/5/CAROLINE/PLANT

County	Wetland Unit No.	Quadrangle	Wetland Name	Acreage	Dominant Vegetative Species
Caroline	2	Preston	Hunting Creek	29	Cattail, Nuphar, Pickerelweed, Alder, Arum, Arrowhead
	14	Fowling Creek	Hoy Creek	6	Cattail, Pondweed, Alder, Nuphar, Naids
	42	Goldsboro	Mt. Zion	10	Pondweed, Cattail, Alder, Willow, Algae, Nuphar
	47	Goldsboro	Tidy Island Ck.	6	Pondweed, Nuphar, Cattail, Willow, Alder
	48	Marydel	No Name	10	Pondweed, Naids, Alder, Willow, Ash, Gum, Carex, Cattail
	50	Goldsboro	Broadway Br.	23	Pondweed, Nuphar, Alder, Smartweed, Algae, Gum
	55	Denton	Spring Branch	5	Pondweed, Willow, Alder, Maple, Arum, Nuphar
	58	Denton	Garland Lake	49	Pondweed, Algae, Willow, Nuphar, Alder
	65	Hobbs	Williston Lake	49	Pondweed, Juncus, Cattail, Nuphar, Milfoil, Alder
	69	Hobbs	Fowling Creek	19	Pondweed, Nuphar, Milfoil, Alder, Willow
	70	Hobbs	No Name	6	Pondweed, Algae, Nuphar, Pickerelweed, Smartweed
	76	Federalsburg	Lake Chambers	7	Pondweed, Willow, Juncus, Nuphar, Buttonbush, Milfoil
	81	Hickman	Smithville Lake	40	Pondweed, Cattail, Duckweed, Pickerelweed, Smartweed, Juncus, Milfpil, Nuphar
			Total Acreage	259	

Figure 5. Abbreviated sample format of a printout of information retrieved from the wetlands information retrieval system in response to the query - /List/all/Wetlands/of/Type/5/in/Caroline/County and List/Plants/.

Results

Rather than conclude this paper with the customary summary, it seems more appropriate to comment briefly on some observations on events that have occurred during wetlands planning efforts in Maryland, since, indeed, the study is not formally concluded.

One aspect that would be of vital concern to interested persons is the effect this study will have on future management policies for wetland/estuarine areas. While it is obviously premature to ascertain the planning effort's results in terms of concrete accomplishments, it is possible to compare the study in terms of some prescribed guidelines for effective management for wetlands/estuarine areas. Especially useful for this purpose is Developing and Managing Estuaries which was prepared by the Estuarine Committee of the Atlantic States Marine Fisheries Commission. The same applies to the approach developed by the Federal Water Pollution Control Administration for its current National Estuarine Pollution Study (Wastler, 1967).

While the list of guidelines useful and, in fact, essential to effective management can be very large, we suggest that it might boil down to these five points from the just mentioned sources:

1) Thorough description of the resources in terms of a detailed inventory.

2) Evaluation of the values represented by the resources, including social, economic and others.

3) Determination of the current controls or management practices affecting the resources.

4) Development of a mangement system (from the above) leading to responsive action at appropriate levels of government.

5) Clearer identification of the research needs still required to aid the governments in reaching management policy decisions.

We believe that the comprehensive structuring of Maryland's wetlands study as outlined in Figure 1 and discussed in earlier paragraphs will closely approximate the five points above. In addition, the results will be augmented by the wetlands information retrieval system,

In terms of day to day activities, there are some experiences worth mentioning briefly. Without being too specific, State agencies have on several occasions referred questions to the study's primary investigators about compiled ecological habitat and inventory information. The problem at hand in each instance was to determine the natural values present and the potential losses that would be incurred from proposed projects with activities destroying wetlands.

While it is regrettable to report that habitat losses (acreage) were not prevented, mitigating action was required from those utilizing the wetlands for other purposes. Such results may be discouraging or disappointing, but it is important to appreciate that formerly very slight consideration was given to wetlands' values, much less the requirement for compensation.

The experience of State agencies requesting wetlands information represents an implicit recognition of the fact that wetlands themselves have values which must be considered before proceeding to destroy them. Every State agency with responsibilities that affect natural resources is now cognizant of the existence of a central source for information compiled on wetlands as a result of wetlands TAC participation. Prior to study activities such information was distributed throughout several agencies (and still is). However, available information was sparse and often obsolete. It is not claimed that the above difficulties have been eradicated completely but the way is finally being defined.

None involved with the planning process or any eventual wetlands management activity should be so naive as to believe that values represented by fish, wildlife and waterfowl will always take precedence over all other plans and uses for Maryland's natural resources base. However, the existence of a strong, logical, substantiated plan for wetlands and estuarine areas should have considerable influence on resolving problems of future developmental activities. The previous history of fragmented and uninformed resistance to projects encroaching on wetlands must become a thing of the past, if a significant amount of wetlands are to be preserved and managed for their abundant and critical contributions to mankind.

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